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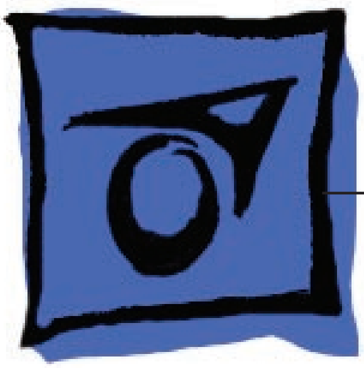

Power Mac G5 (Late 2005)

Power Mac G5 (Late 2005 Dual 2.0/2.3 GHz) and
Power Mac G5 (Late 2005 Quad)

19 October 2005

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Power Mac G5 (Late 2005)

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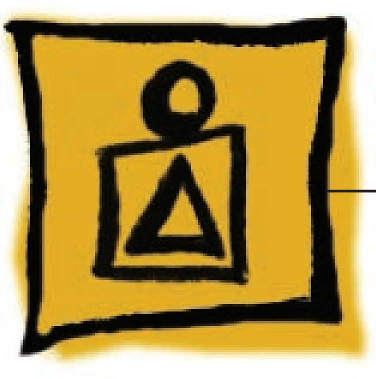

Basics

Power Mac G5 (Late 2005)

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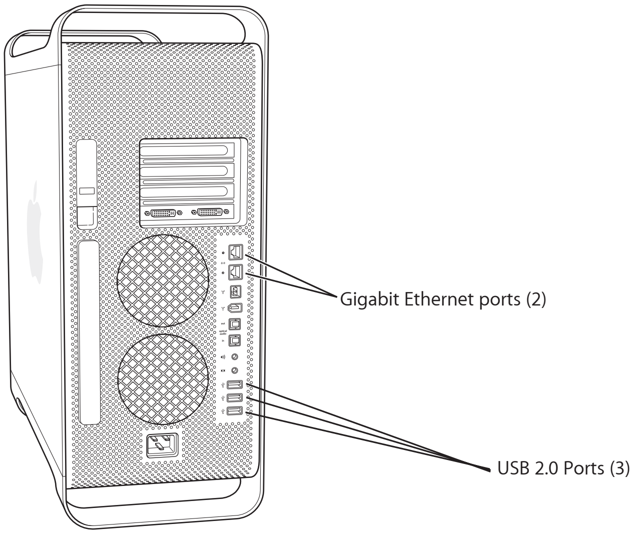
Overview

Power Mac G5 (Late 2005) is the third generation of Power Mac G5 computers. It leverages the G5 architecture with the following new features:

- New G5 dual core processor (two processors on one chip)
- 533 MHz DDR2 main memory
- PCI Express 16x video support
- PCI Express 4x and 8x expansion support
- Two enhanced 1GB Ethernet ports on the back panel
- Three USB 2.0 ports on the back panel
- Combination Airport Express/Bluetooth card (CTO option)
- External Apple USB modem (CTO option)
- Diagnostic LEDs on logic board

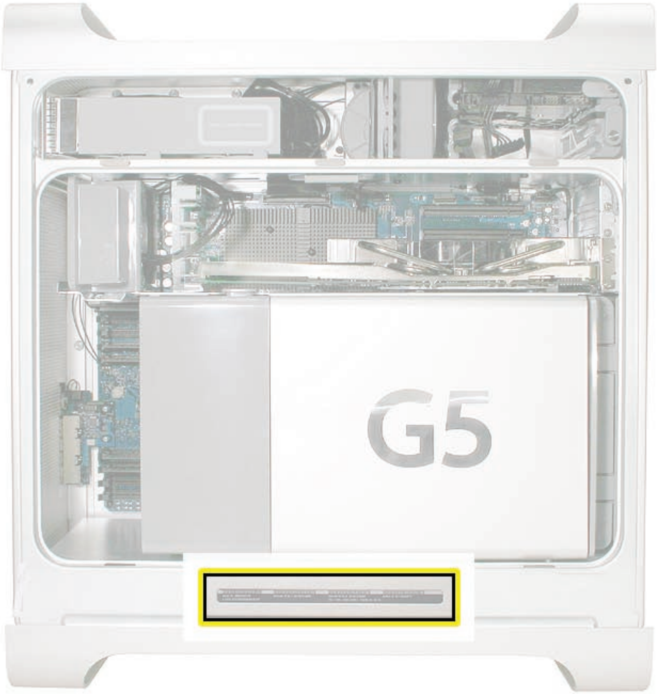
Differentiating the Power Mac G5 (Late 2005)

While Power Mac G5 (Late 2005) computers look similar to earlier Power Mac G5 models, you can easily differentiate the Power Mac G5 (Late 2005) by checking the back panel. Power Mac G5 (Late 2005) computers include two Gigabit Ethernet ports and three USB 2.0 ports, as illustrated below. Earlier models include just one Gigabit Ethernet port and two USB 2.0 ports.



Serial Number Location

To identify a particular Power Mac G5 (Late 2005) computer, check the computer's serial number, which lists the model's configuration. The serial number is located directly below the air deflector inside the side access panel.



Liquid Cooling System (LCS)

The Power Mac G5 (Late 2005 Quad) configuration uses a liquid cooling system (LCS) to manage the temperature in the computer. The liquid cooling system is sealed and is designed to be opened only by an Apple Authorized Service Provider (AASP). To ensure proper safety and handling of the LCS system, please read the following information.

General Safety Information

The LCS cooling system fluid is predominantly water (80% or greater) with a mixture of corrosion inhibitors and bacterial growth preventatives. In normal use in a non-leaking LCS there are no special handling considerations. However, if a leak in the system is suspected or discovered and the computer is plugged in, remove power to the computer by pulling the power plug.

Nitrile or rubber glove should be worn when handling an LCS module that is leaking or suspected to be leaking. Evidence of leaks would include corrosion around fittings in the LCS coolant system, a liquid present, or a slick or slimy feel when handling the part. For leaks or spills, wipe up the fluid using rags, paper towels, or other suitable materials. Dispose of all cleaning materials according to local laws and regulations Do not combine used coolant with any other chemical.

When returning a failed LCS module to Apple, place the module (leaking or not) in the packaging that the replacement module came in. Follow the packaging instructions included with the replacement module. Failure to follow the instructions could damage the equipment and void warranty coverage.

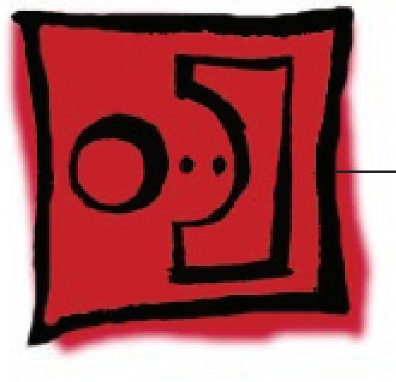
Safety Guidelines

Below is a summary of first aid measures for exposure to the liquid. For complete instructions refer to the Material Safety Data Sheets (MSDS) for the liquid. The Safety Data Sheets can be found at **http://www.apple.com/environment/resources/msds.html**.

> **Eyes:** Immediately flush with plenty of water. If wearing contact lenses, after initial flushing, remove contact lenses and continue to flush for 15 minutes. Have eyes examined by a medical professional if irritation persists.
>
> **Skin:** Wash skin with running water. Remove contaminated clothing. The recommended flushing is 15 minutes if pain or irritation occurs. Seek medical attention if irritation or redness develops.

Ingestion: Ingestion of this product, while unlikely to occur in its containment, may cause irritation of the mouth and throat, gastric upset, stomach ache, cramps, nausea and vomiting. If the product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Contaminated individuals should drink milk, egg whites, or large quantities of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

Service Source



Take Apart

Power Mac G5 (Late 2005)

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General Information

Orientation

For most take-apart procedures, it is recommended that you lay the computer on its side before removing or installing the part. For proper operation, however, Apple recommends that the unit be run in the upright position. The computer should never be operated on its side with the access panel facing down.

Tools

The following tools are required to service all configurations of the computer:

- Long-handled magnetic Phillips #1 screwdriver
- Long-handled 3 mm flathead hex screwdriver
- Long-handled 4 mm ballhead hex screwdriver
- Long-handled T-10 torx screwdriver
- 9/32-inch nut driver
- 1/4-inch nut driver
- Short-handled or right-handled magnetic Phillips #2 screwdriver
- Flatblade screwdriver
- Jeweler's flatblade screwdriver
- Jeweler's Phillips #0 screwdriver
- Small wire cutter
- Xacto knife
- Tape (for temporarily holding cables out of the way)
- Small mirror (for seeing small boards inside the enclosure)
- Soft cloth (for protecting removed parts from scratches)

Special Tools

Three of the tools listed above are available through GSX. The tools and their part numbers are

- Long-handled 3 mm flathead hex screwdriver (922-7122)
- Long-handled 4 mm ballhead hex screwdriver (922-7082)
- Long-handled T-10 torx screwdriver (922-7083)

These tools are necessary for removing/installing the processor and logic board in all configurations.

Parts Requiring Enclosure Replacement

The following are not separate, orderable parts. To replace them, you must replace the enclosure.

- Media blower
- Hard drive locking latches
- Hard drive bay
- Optical drive levers
- Media shelf
- Media bay sensor
- Media bay sensor and air deflector sensor cable
- Rear panel latch

Take Apart Procedures

This manual covers different configurations of the Power Mac G5 (Late 2005) computer. Some configurations may look slightly different from the one shown in the illustrations; however, except where indicated, the following procedures apply to all configurations.

Opening the Computer

Tools

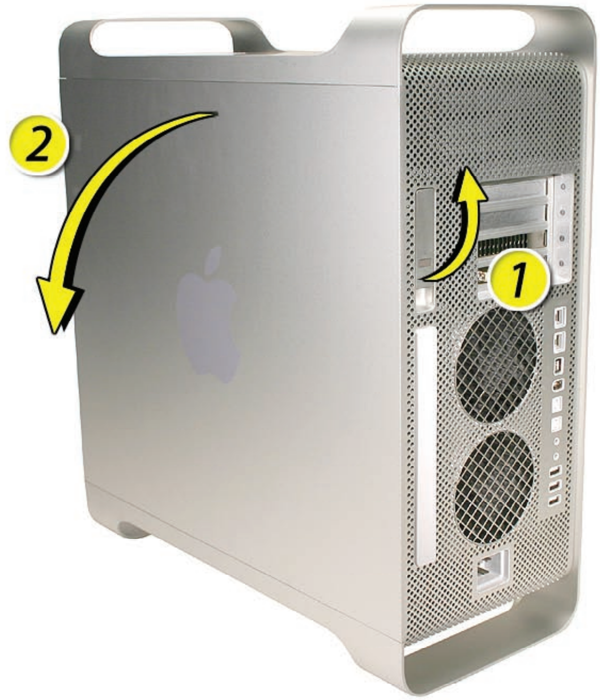
No tools are required for this procedure.

Preliminary Steps

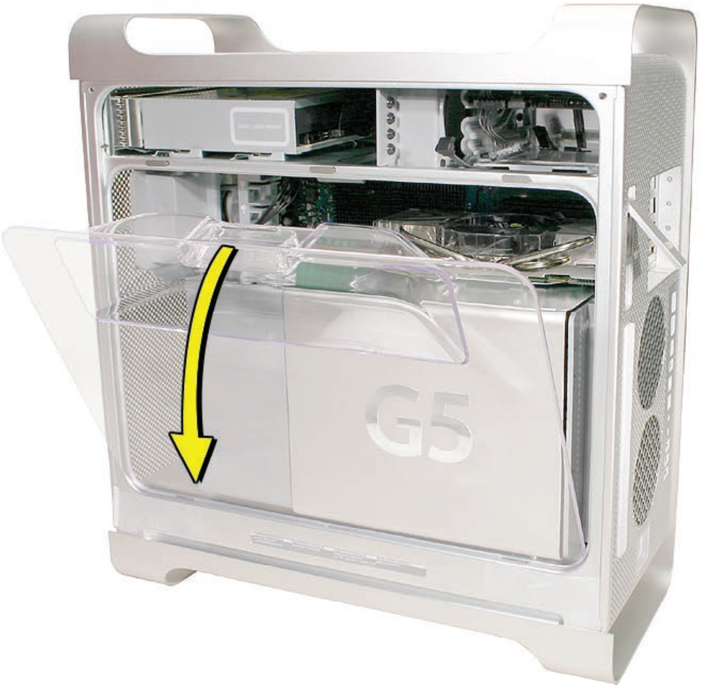
1. Shut down the computer.
   Warning: Always shut down the computer before opening it to avoid damaging its internal components or the components you are installing. Do not open the computer or attempt to install items inside it while it is on.
2. Wait 5 to 10 minutes to allow the computer's internal components to cool.
   Warning: After you shut down the system, the internal components can be very hot. You must let the computer cool down before continuing.
3. Unplug all external cables from the computer except the power cord.
4. Touch the metal PCI access covers on the back of the computer to discharge any static electricity from your body.
   Important: Always discharge static before you touch any parts or install any components inside the computer. To avoid generating static electricity, do not walk around the room until you have finished working and closed the computer.
5. Unplug the power cord.
   Warning: To avoid damaging its internal components or the components you want to install, always unplug the computer before attempting any take-apart procedure.
6. Put on an ESD wrist strap.

Procedure

1. Hold the side access panel and lift the latch on the back of the computer.
   Warning: The edges of the access panel and the enclosure can be sharp. Be very careful when handling them.
2. Remove the access panel and place it on a flat surface covered by a soft, clean cloth.
   Replacement Note: Make sure the latch is in the up position before replacing the access panel. If the latch is down, the access panel will not seat correctly in the enclosure.



3. Remove the air deflector and place it on a soft, clean cloth.



Replacement Note: To replace the air deflector, insert the three tabs on the bottom edge of the deflector into the three slots in the bottom frame of the enclosure. Then swing the deflector up flush against the top frame of the enclosure.

Important: Make sure you re-install the air deflector before replacing the access panel. If the air deflector is not installed, the computer will not function properly.

Serial ATA Hard Drive

The Power Mac G5 computer can accommodate two serial ATA hard drives in its internal hard drive bay. In most configurations, a single hard drive occupies the top portion of the bay. You can install one additional serial ATA hard drive to the empty slot in the bay.

Important: Use the original Apple cables that came with the Power Mac G5 when installing ATA hard drives.

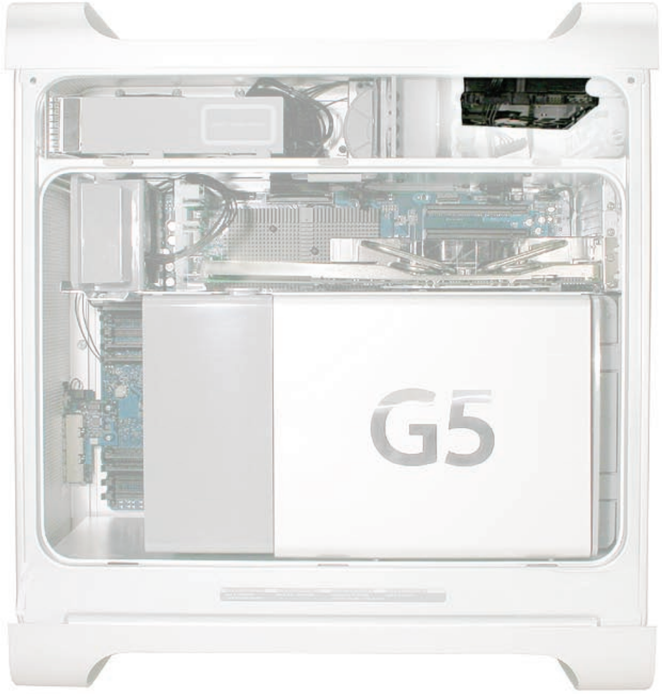
Tools

The only tool required for this procedure is a Phillips #1 screwdriver.

Preliminary Steps

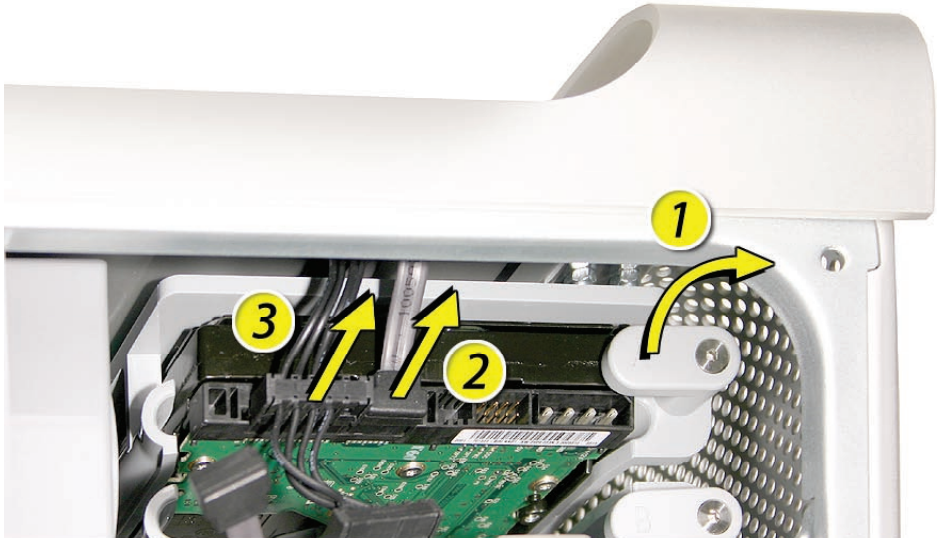
Before you begin, open the computer.

Part Location

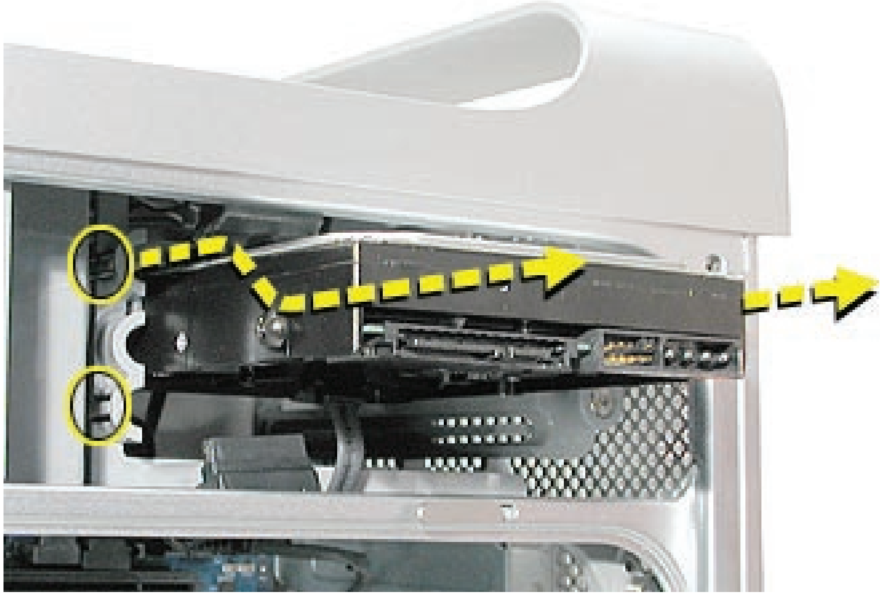


Procedure

1. Release the drive locking latch by rotating it up.
2. Disconnect the drive data cable and power cable from the hard drive.

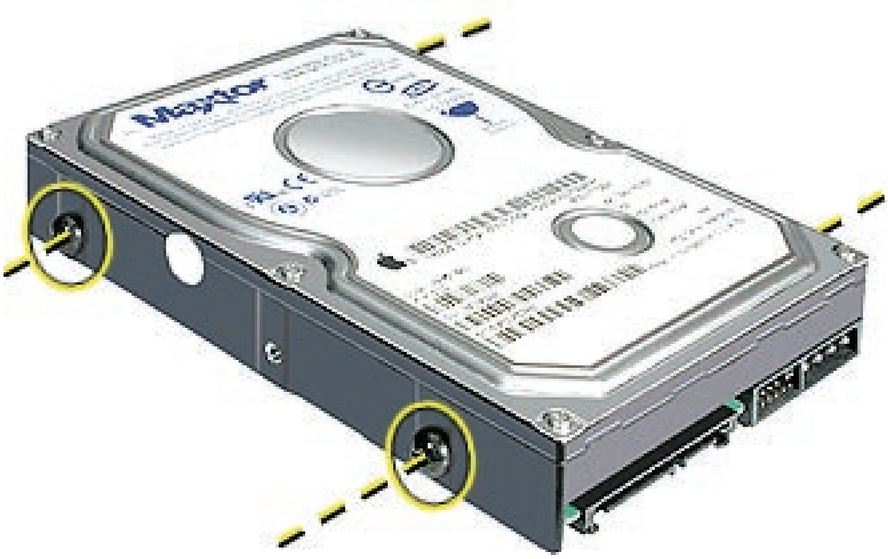


3. Pull the drive out of the drive bay, being careful not to touch the bottom of the drive.
   Note: If you encounter resistance, use a flatblade screwdriver to release the latches on the drive bay rails as you pull the drive out of the bay. (See circled areas on the illustration below.) If two drives are installed, remove the bottom drive first.

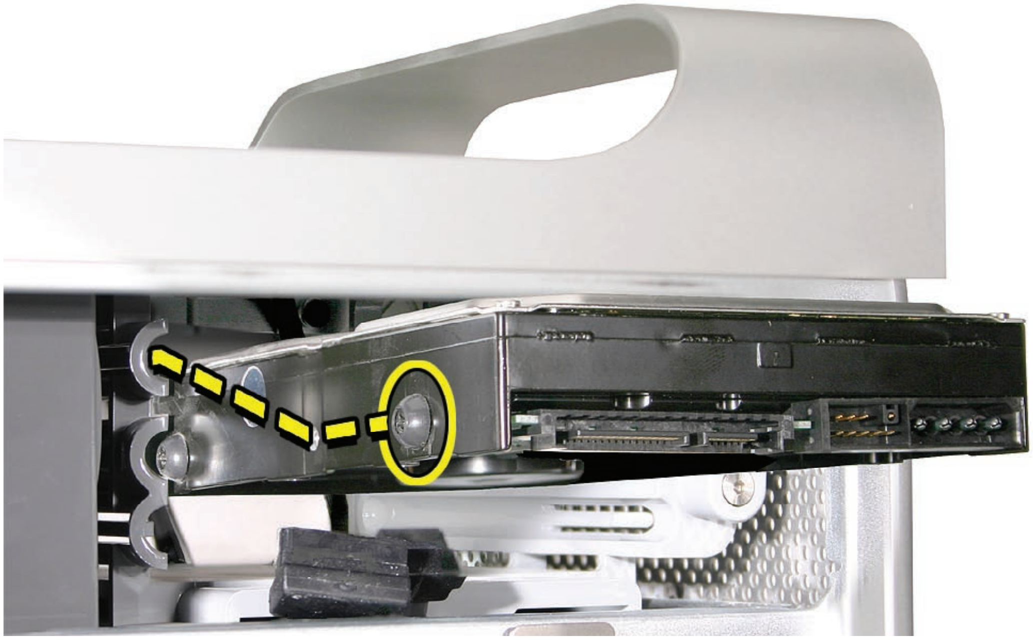


Important: If the printed circuit board (PCB) is exposed on the bottom of the hard drive, hold the drive by its sides. To avoid damaging the replacement drive, take care not to touch the PCB during installation.

Replacement Note: If you are replacing a hard drive with a new drive, transfer the four guide screws from the sides of the original drive to the new drive. If you are installing an additional drive, transfer the guide screws from the side of the hard drive bay to the drive.



Replacement Note: When replacing the top drive, make sure the guide screws align with the middle slot of the drive bay, and then gently push the drive into the bay until it snaps into place.



When installing a bottom drive, align the guide screws with the bottom slot of the drive bay and slide the drive in until it snaps into place.

Serial ATA Hard Drive Data Cable

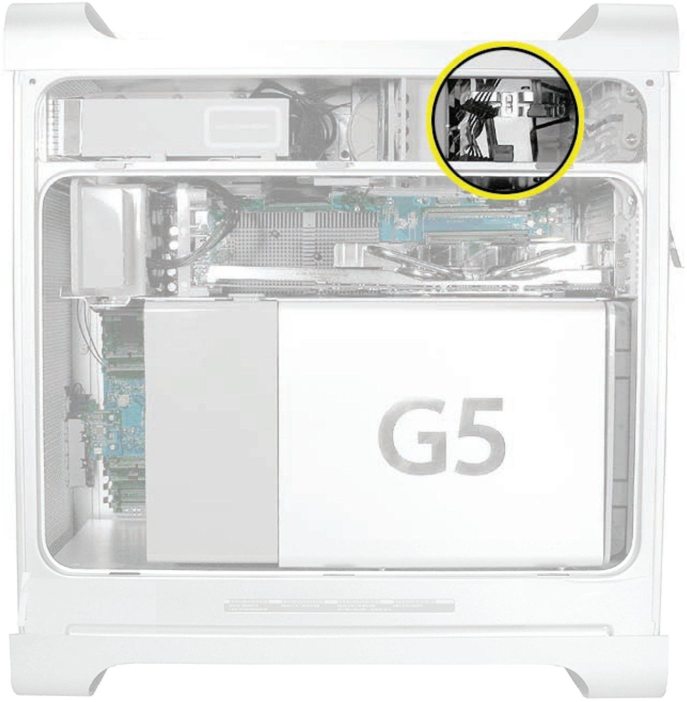
Tools

The only tool required for this procedure is a small wire cutter.

Preliminary Steps

Before you begin, open the computer and **remove the hard drive(s)**.

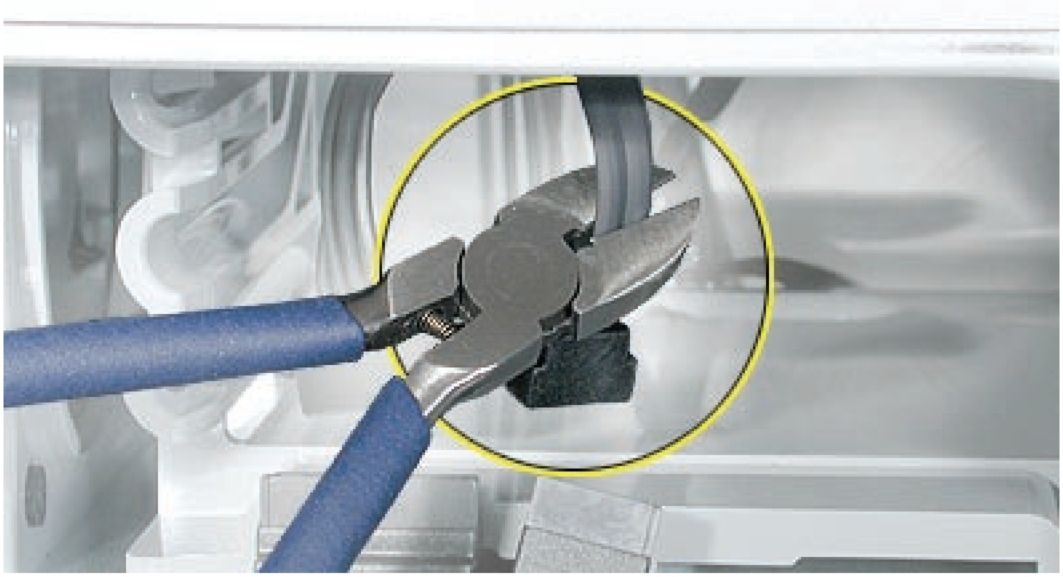
Part Location



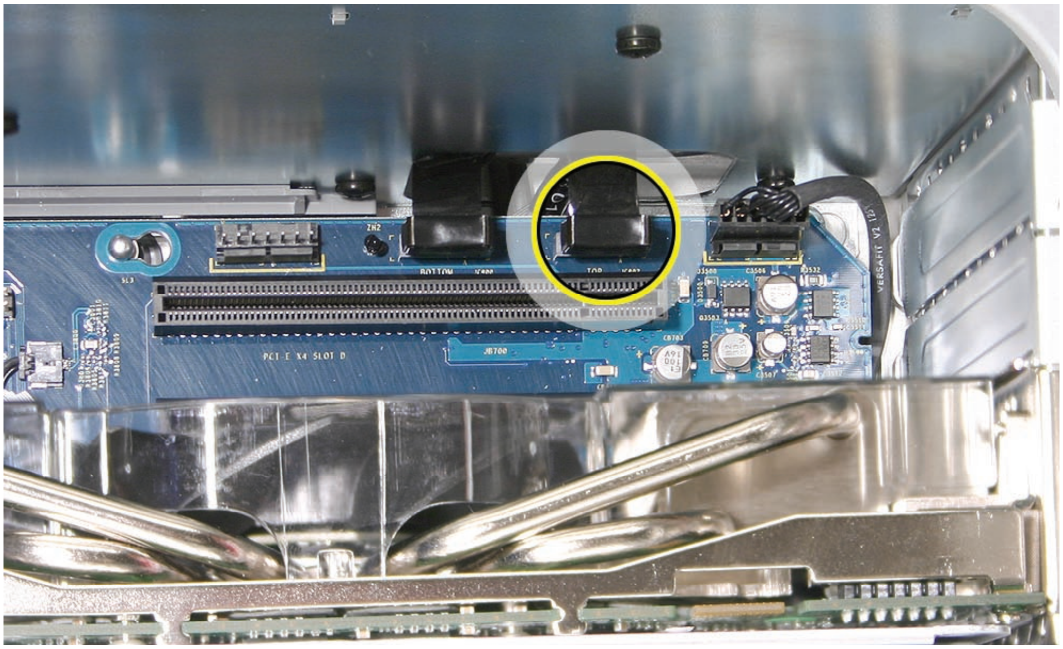
Procedure

Upper Hard Drive Cable

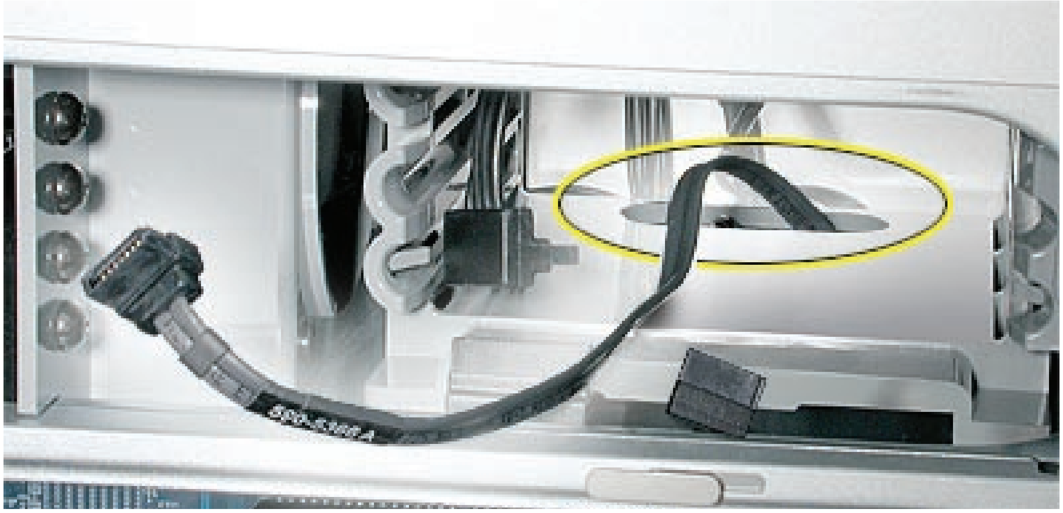
1. Clip off the connector from the hard drive end of the upper hard drive data cable.



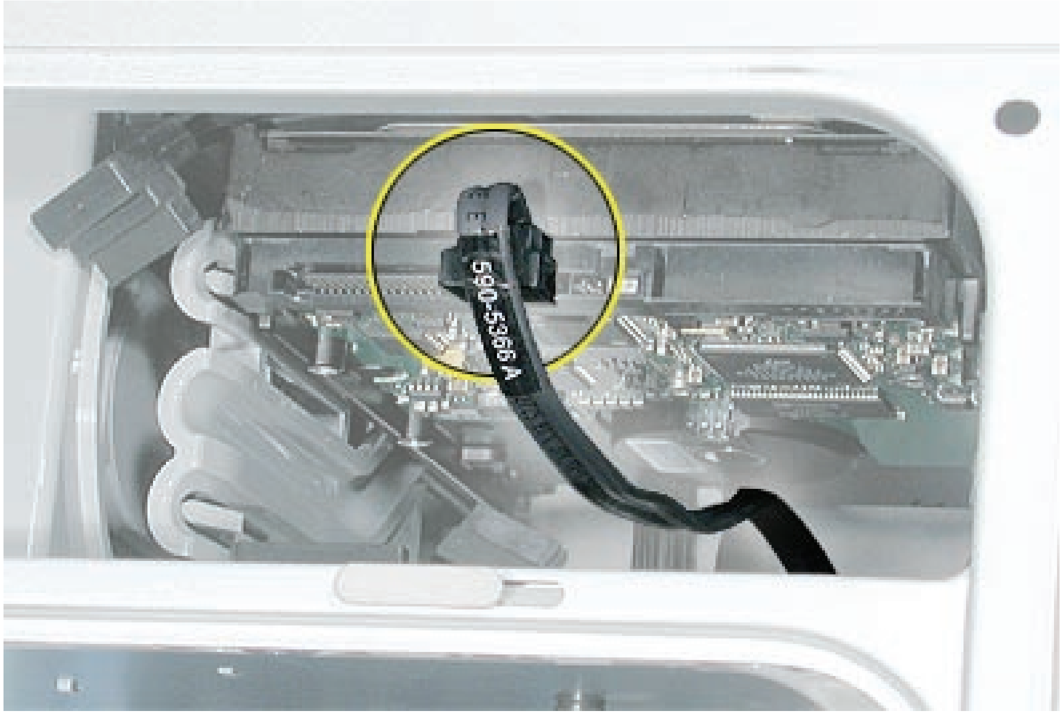
2. Disconnect the cable from the logic board, pull the cable out of the hard drive bay, and remove the cable from the enclosure.



Replacement Note: When installing the replacement upper hard drive cable, first route the cable through the opening in the hard drive bay.

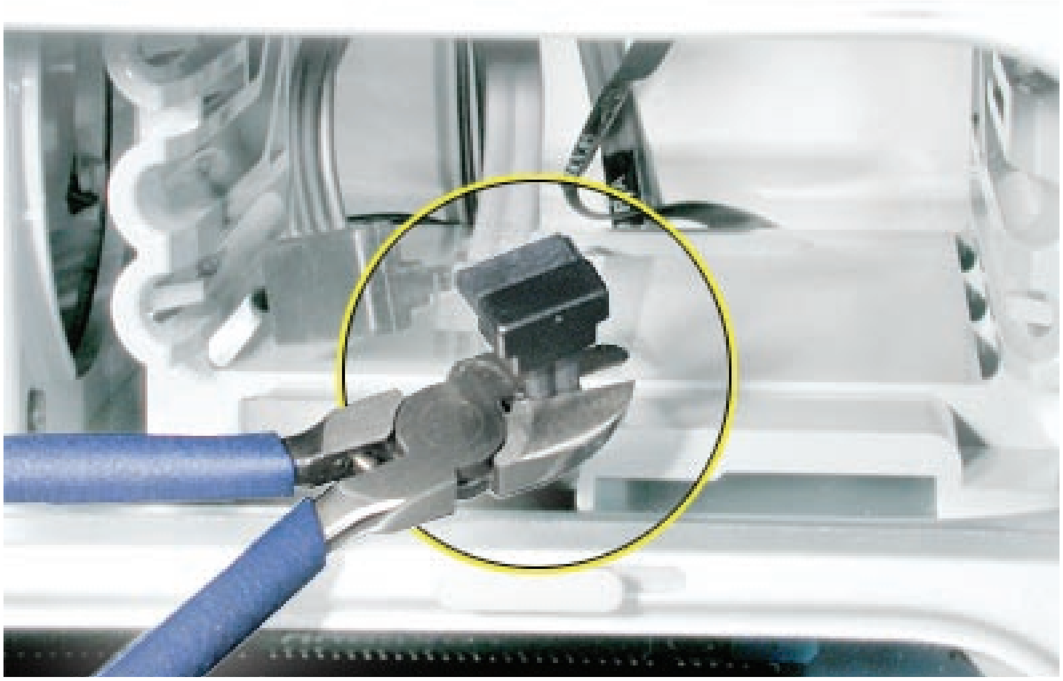


Then install the upper hard drive with the cable routed below the drive, and connect the cable to the drive as illustrated.

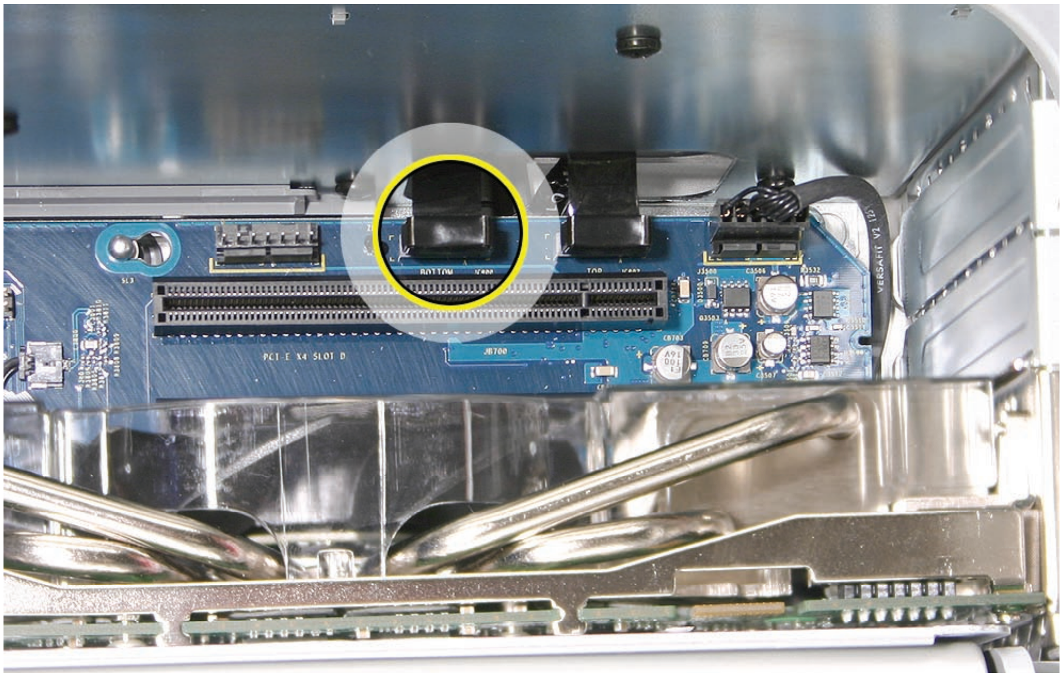


Lower Hard Drive Cable

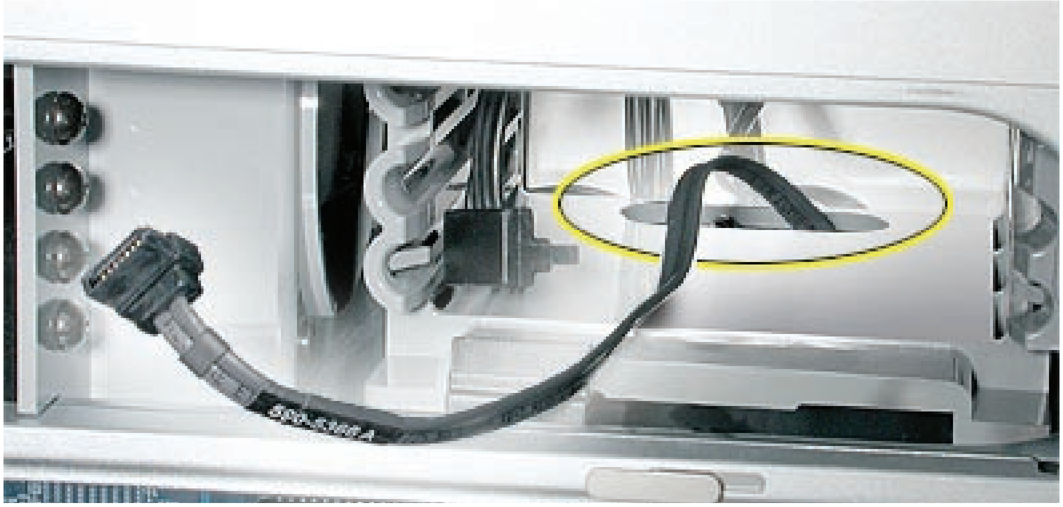
1. Clip off the connector from the hard drive end of the lower hard drive cable.



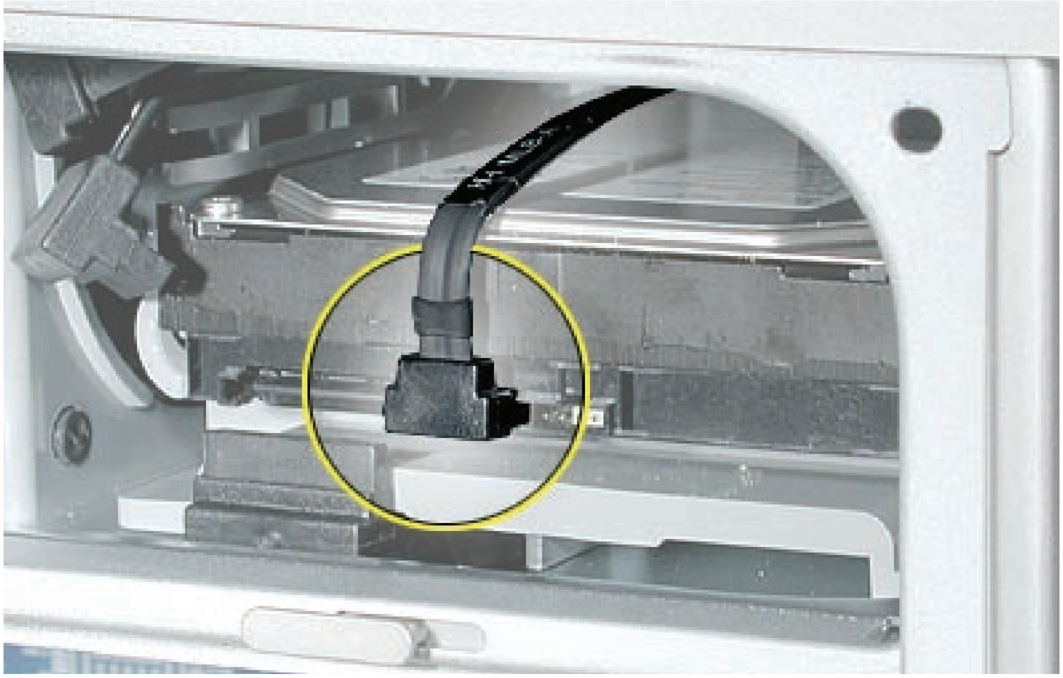
2. Disconnect the cable from the logic board, pull the cable out of the hard drive bay, and remove the cable from the enclosure.



Replacement Note: When installing the replacement lower hard drive cable, first route the cable through the opening in the hard drive bay.



Then install the lower hard drive with the cable routed above the drive, and connect the cable to the drive as illustrated.



Optical Drive

Important: When installing a replacement optical drive, use the original Apple cables that came with the Power Mac G5.

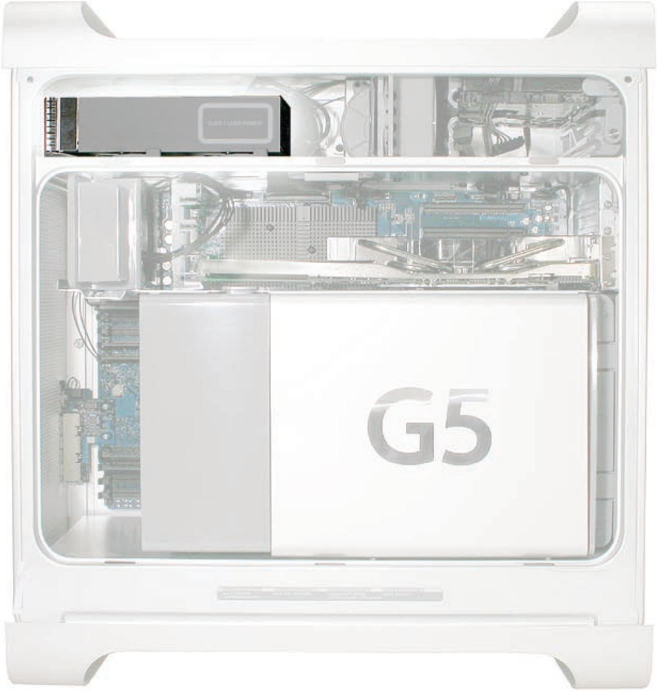
Tools

No tools are required for this procedure.

Preliminary Steps

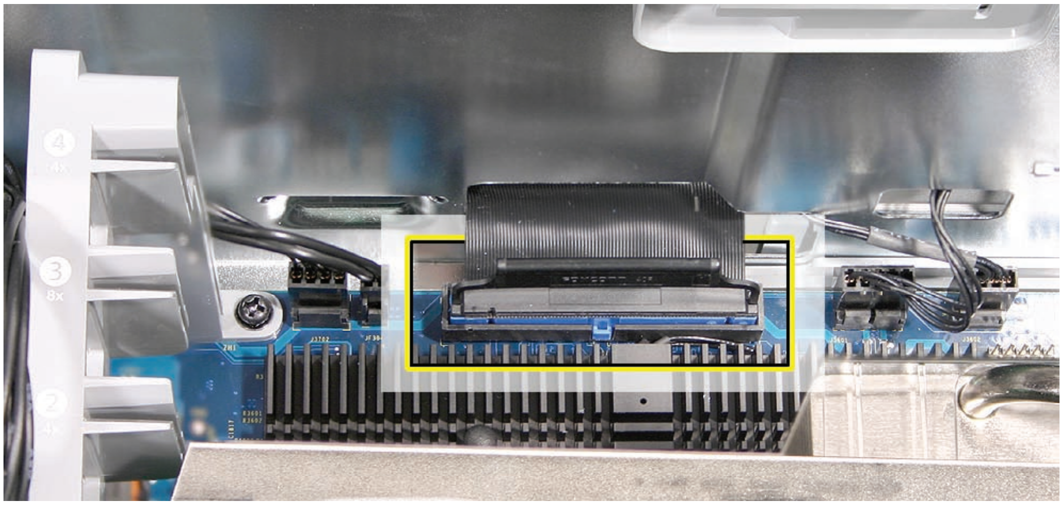
Before you begin, open the computer.

Part Location

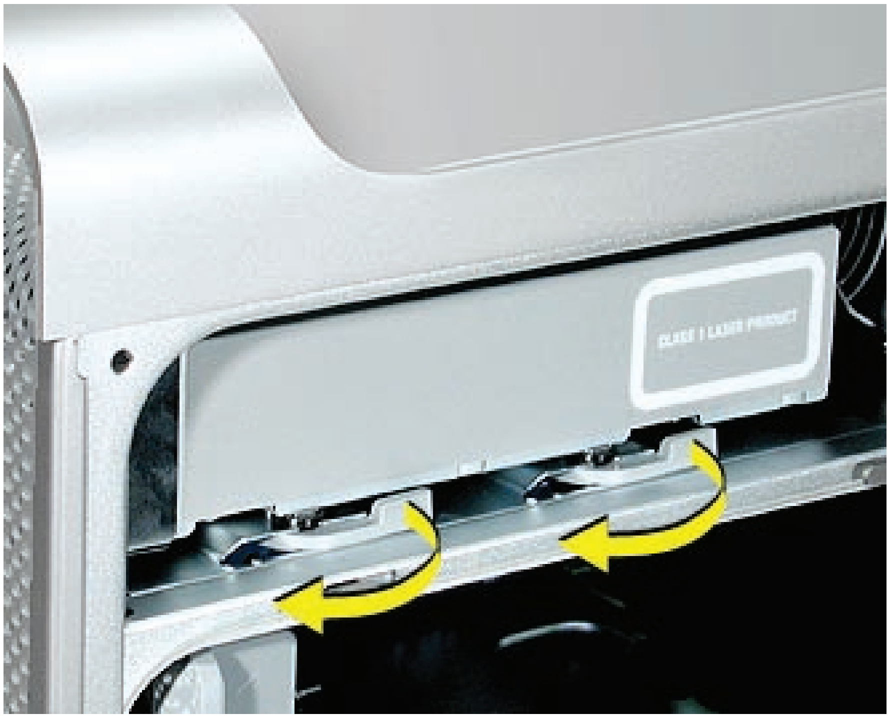


Procedure

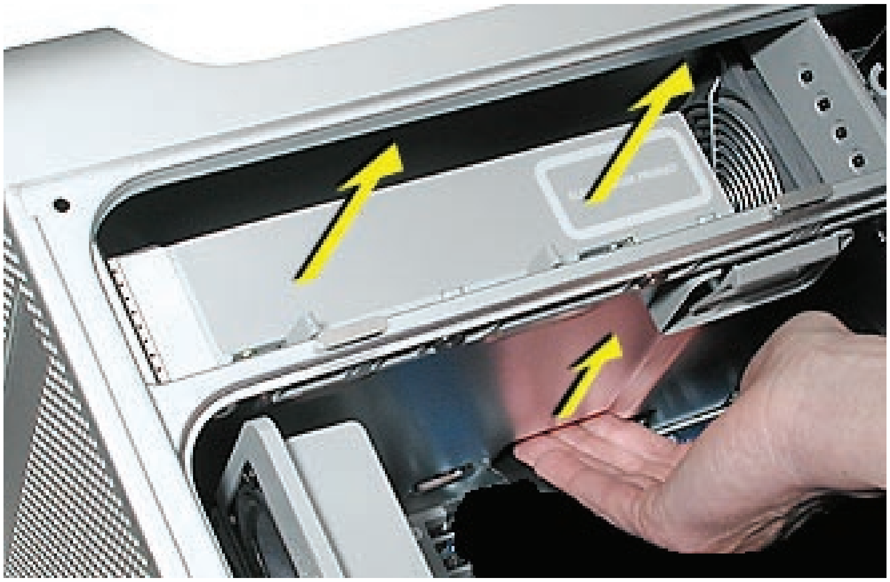
1. Disconnect the optical drive ribbon cable from the logic board. (The cable connector is located under the media shelf that holds the optical drive.)



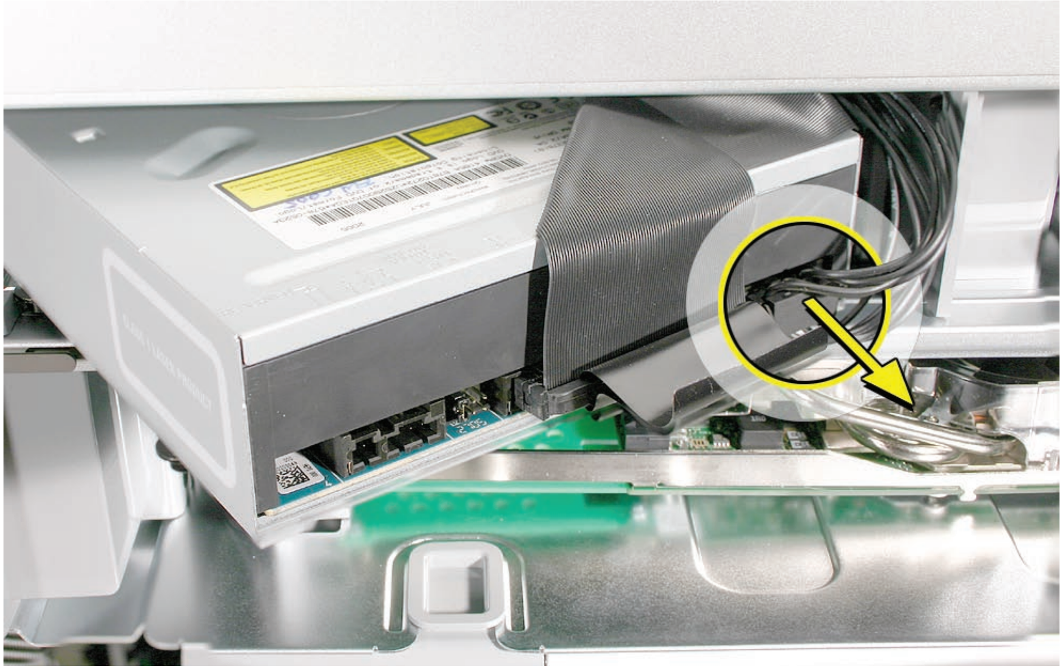
2. Push the optical drive levers out to release the drive.



3. Place the fingers on one hand inside the opening for the optical drive cable. Push the edge of the drive forward and then up. The drive will move part way out of the media shelf.



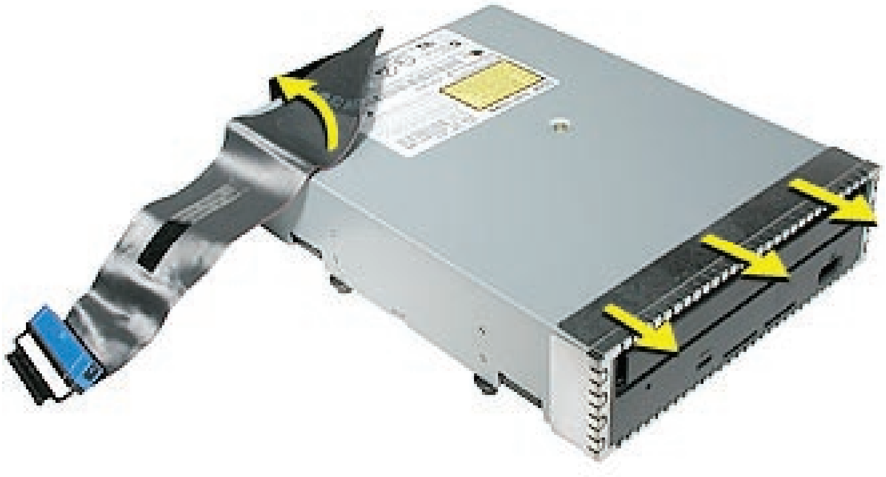
4. Disconnect the power cable from the drive.



5. Route the drive ribbon cable out through the opening in the media shelf and remove the drive and ribbon cable from the computer.

6. If you are replacing the drive with a new drive, do the following:
    - Disconnect the ribbon cable from the back of the drive, and then carefully pry the cable from the top of the drive. Transfer the cable to the top of the replacement drive, and connect the cable to the drive.

      Note: Reusable adhesive tape on the underside of the cable attaches the cable to the drive. When removing the cable from the original drive, be careful to keep the tape with the cable.
    - Carefully remove the EMI shield from the front of the original drive and transfer it to the front of the replacement drive.



Replacement Note: Insert the optical drive part way into the optical drive bay, and connect the power cable to the drive. Then bend down the free end of the ribbon cable, route it through the opening at the back of the media shelf, and connect the cable to the logic board.

Front Inlet Fan Assembly

Tools

No tools are required for this procedure.

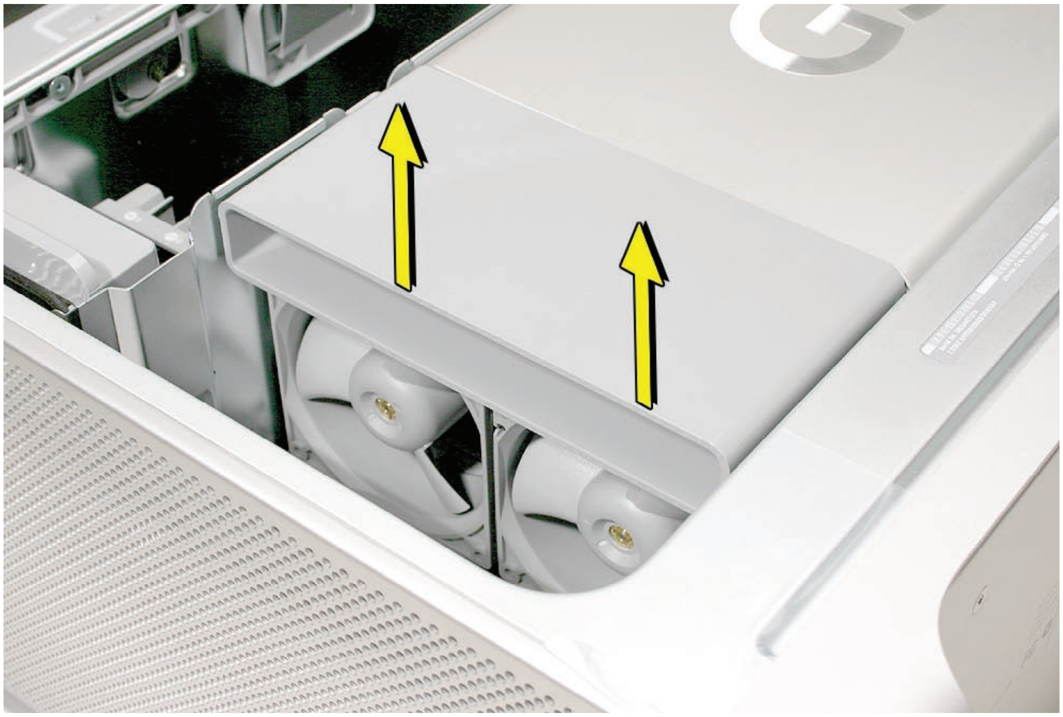
Preliminary Steps

Before you begin, open the computer and lay it on its side with the access side facing up.

Part Location

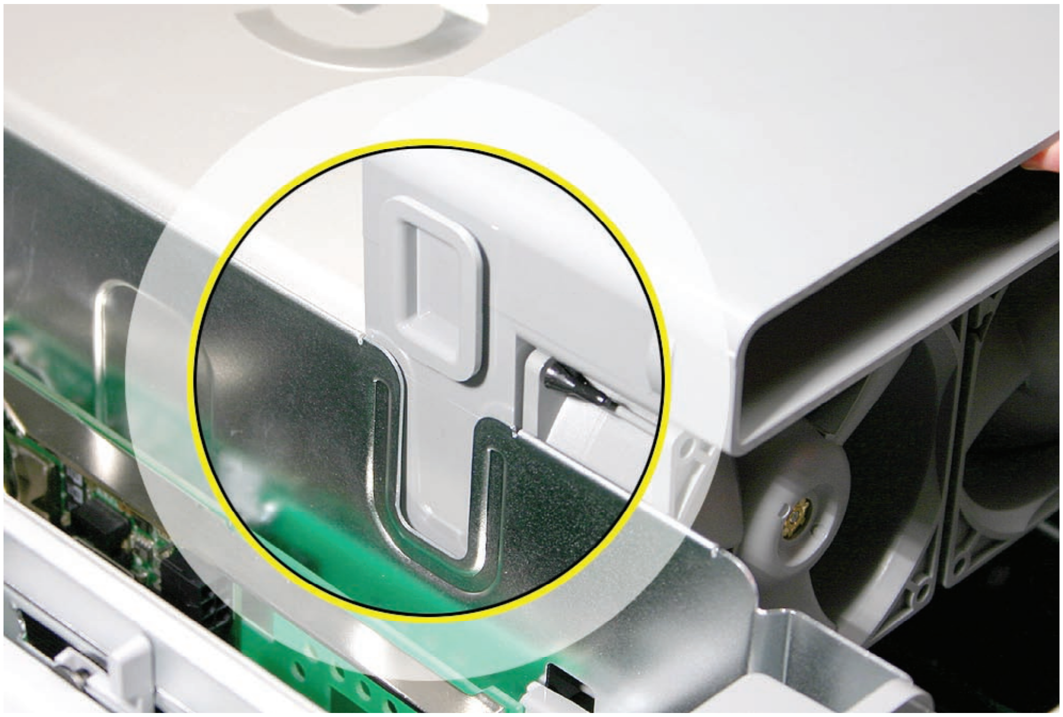
Procedure

1. Hold the front inlet fan assembly by the front handle and firmly pull it out of the computer.



Replacement Note: To replace the front inlet fan bracket in the enclosure, align the large rail on the bracket with the cutout in the PCI divider and press firmly.

Important: Make sure the connector on the fan fully engages the fan connector on the logic board, or the computer will not operate properly. Gently pull the fan assembly to test whether it is connected.

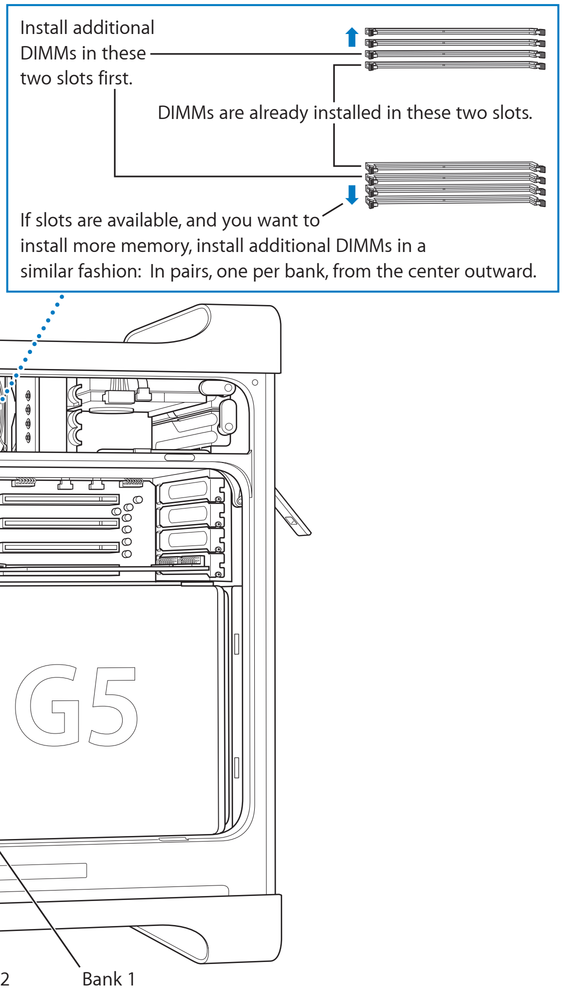


Memory (DIMMs)

The Power Mac G5 (Late 2005) has eight DIMM slots for PC2 4200, 533 MHz, Double-Data-Rate 2 (DDR2) SDRAM DIMMs. The slots are arranged in two banks of four slots each. Power Mac G5 (Late 2005) computers come with a minimum of 512 MB of RAM, installed as a pair of 256 MB DIMMs in the two center slots. Additional DIMMs can be installed in the open DIMM slots, as illustrated below.

Note: DIMMs must be installed in equal-sized pairs from the center outward.

The SDRAM DIMMs must be installed in pairs with one DIMM per bank.


Install additional DIMMs in these two slots first.
DIMMs are already installed in these two slots.
If slots are available, and you want to install more memory, install additional DIMMs in a similar fashion: In pairs, one per bank, from the center outward.
G5
Bank 2
Bank 1

In the Power Mac G5 (Late 2005), DIMMs must fit these specifications:

- PC2 4200, 533 MHz, DDR2 DIMMs
- 240-pin module
- Maximum number of memory devices on DDR2 SDRAM: 16
- Nonparity
- No error-correcting codes (non-ECC) modules are preferred but you can also use ECC modules. However, do no mix ECC and non-ECC memory modules.
- Unbuffered (registered or buffered DDR2 SDRAM cannot be used)

Important: Memory from older Macintosh computers is not compatible with the Power Mac G5 (Late 2005).

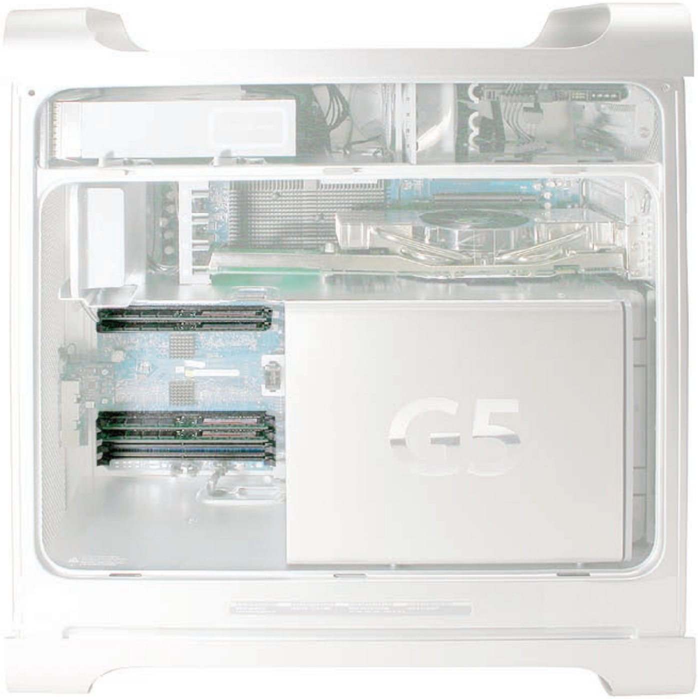
Tools

No tools are required for this procedure.

Preliminary Steps

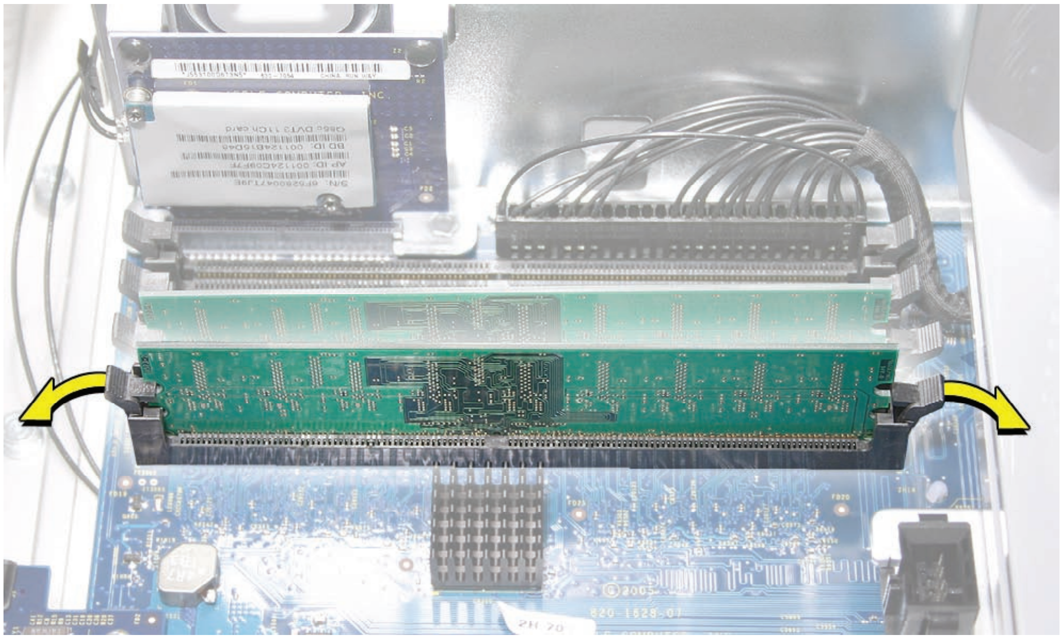
Before you begin, open the computer, lay it on its side with the access side facing up, and **remove the front inlet fan assembly**.

Part Location

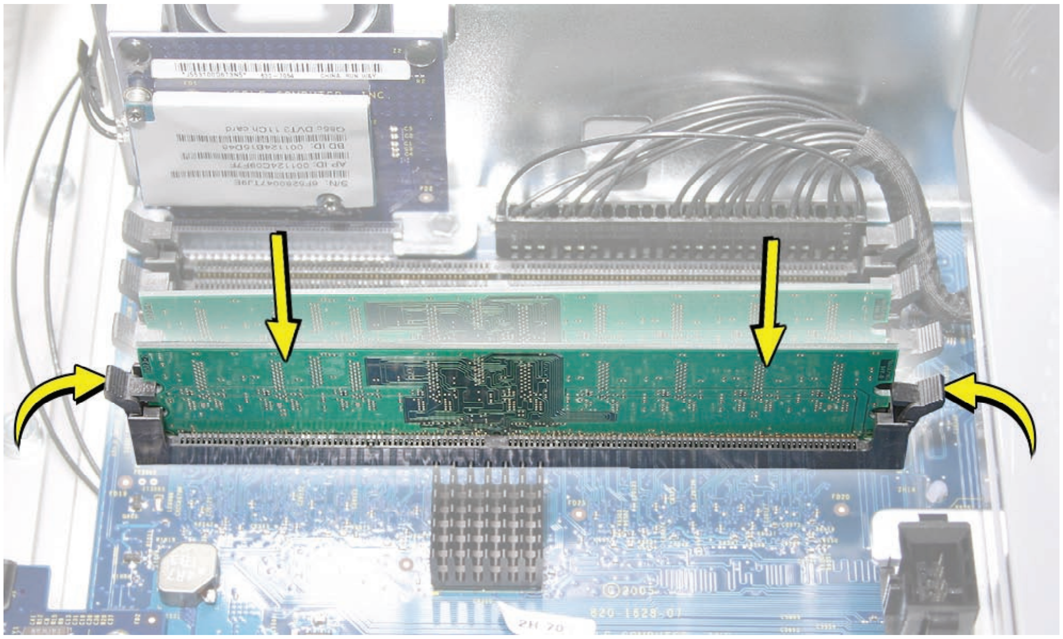


Procedure

1. Locate the DIMM slots on the logic board.
2. Open the ejectors on the DIMM slot by pushing them out to the sides.
3. Holding the DIMM by both top corners, lift it straight up out of the computer.



Replacement Note: Align the DIMM in the slot and push both ends of the DIMM down until the tabs are vertical and the ejectors snap into place.



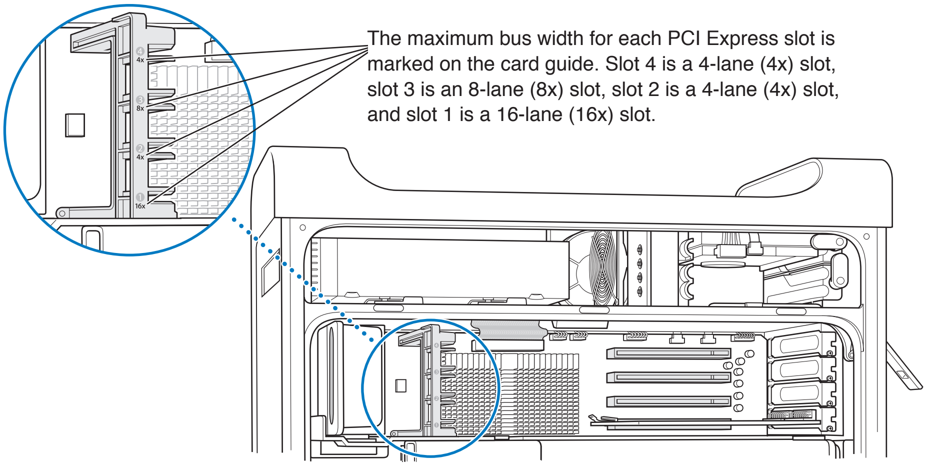
Important: Do not touch the DIMM connectors. Handle the DIMM only by the edges.

Graphics Card/PCI Express Card

Power Mac G5 (Late 2005) computers have four expansion card slots that accommodate PCI Express cards. The computers come with a high-performance 16-lane (16x) PCI Express graphics card installed in slot 1. The card contains the graphics processor unit (GPU) and provides the computers' display ports.

You can install additional PCI Express cards in slots 2–4. Install a second card in slot 3, a third in slot 4, and a fourth in slot 2 to take advantage of the bus bandwidth of each slot. Before installing a card, check the specifications to make sure it can operate in the Power Mac G5 (Late 2005).

Note: When certain high-end video cards are installed in slot 1, they block the adjacent PCI Express slot (slot 2). As a result, you can install PCI Express cards in slots 3 and 4 but not in slot 2.



The maximum bus width for each PCI Express slot is marked on the card guide. Slot 4 is a 4-lane (4x) slot, slot 3 is an 8-lane (8x) slot, slot 2 is a 4-lane (4x) slot, and slot 1 is a 16-lane (16x) slot.

Important: Combined maximum power consumption for all four expansion slots should not exceed 200 W. Combined maximum video RAM for all graphics cards is 1 GB.

While all slots can accommodate PCI Express cards that have up to 16-lanes, if you install a card that requires a greater bandwidth than the slot provides, the card will operate at the bandwidth of the slot. For example, an 8x card installed in a 4x slot will operate as a 4x card. Refer to the following table for details.

PCI Express Slot	Bus Bandwith (x)	Connector (Lane)
4	4x	16 lane
3	8x	16 lane
2	4x	16 lane
1	16x	16 lane

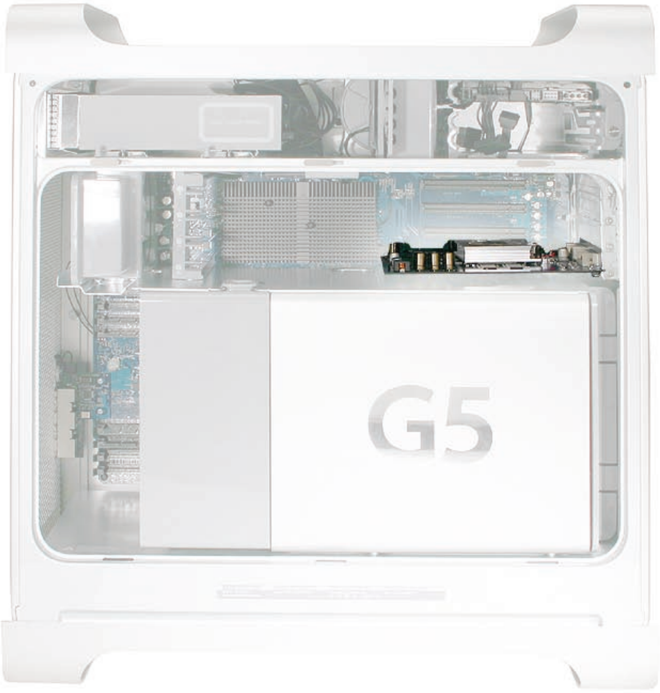
Tools

The only tool required for this procedure is a Phillips #1 screwdriver.

Preliminary Steps

Before you begin, open the computer and lay it on its side with the access side facing up.

Part Location

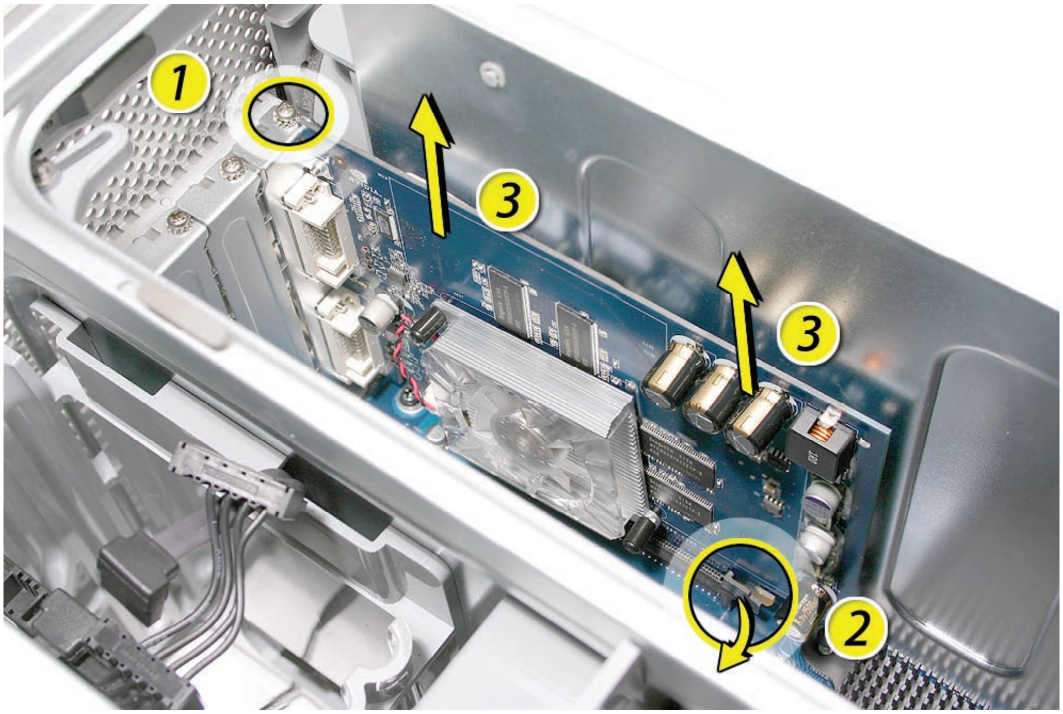


Procedure for All Cards Except NVIDIA Quadro FX 4500

Install video cards in slot 1 only. Install other PCI Express cards in the slots labeled 2, 3, and 4.

Warning: When removing or installing a card, handle it only by the edges. Do not touch its connectors or any of the components on the card. Lift the card straight out from the connector to remove it, and insert it straight into the connector to install it. Do not rock the card from side to side and don't force the card into the slot. Once the replacement card is installed, pull on it gently to check that it is properly connected.

1. Remove the screw that mounts the card to the enclosure.
2. If you are removing a video card, pull back the small locking clip at the front of the connector.
3. Holding the card by the top corners, gently pull up the card and remove it from its expansion slot.



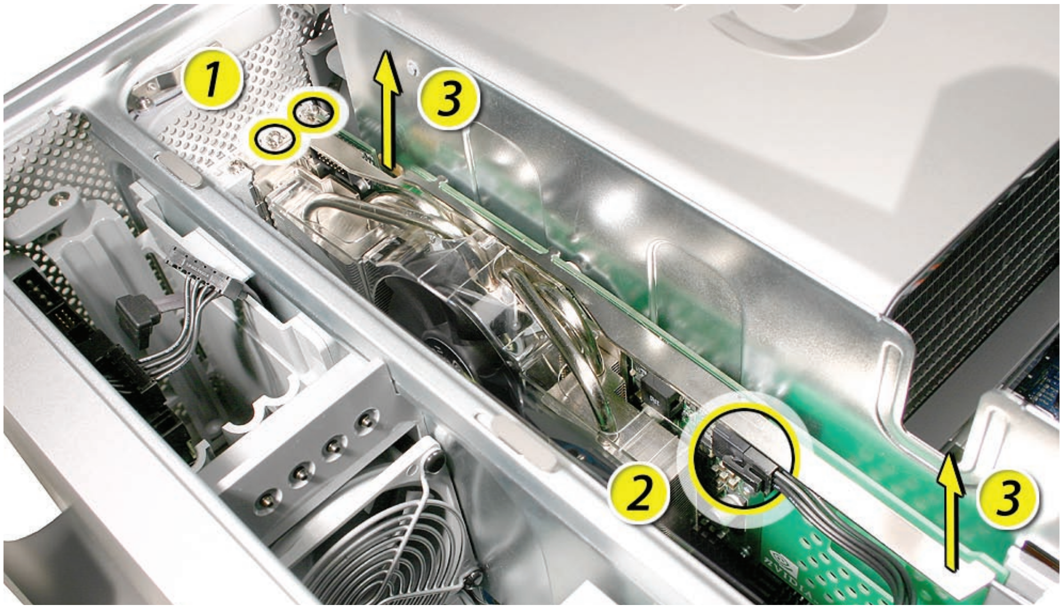
Replacement Note: Align the card's connector with the expansion slot and press until the connector is inserted all the way into the slot. If you're installing a 12-inch card, make sure the card engages the appropriate slot in the PCI card guide.

- Don't rock the card from side to side; instead, press the card straight into the slot.
- Don't force the card. If you meet a lot of resistance, pull the card out. Check the connector and the slot for damage or obstructions, then try inserting the card again.
- Pull the card gently to see if it is properly connected. If it resists and stays in place, and if its gold connectors are barely visible, the card is connected.

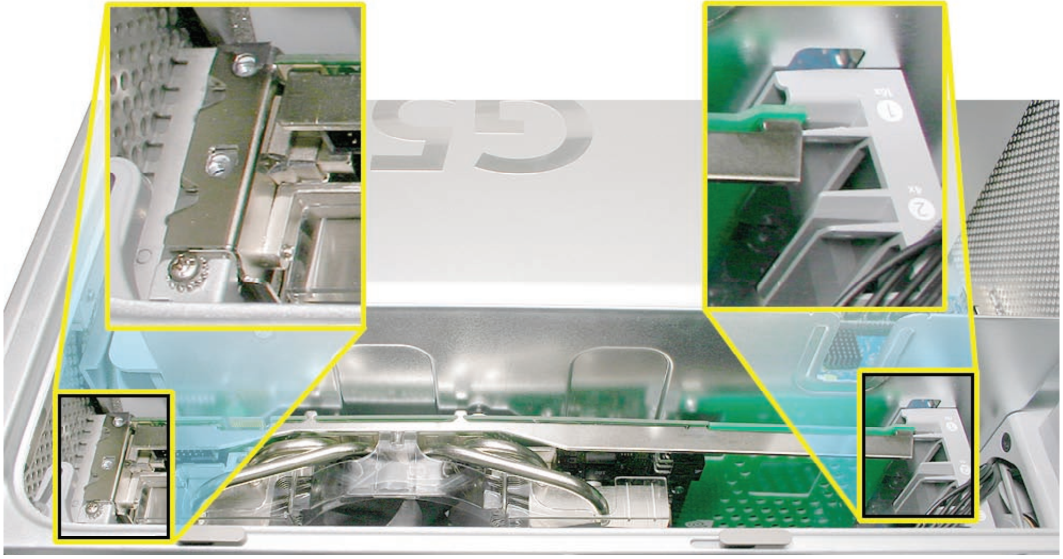
Procedure for NVIDIA Quadro FX 4500 Card and Cable

To remove the Quadro FX 4500 card, do the following:

1. Remove the two screws that mount the card to the enclosure.
2. Disconnect the Quadro FX 4500 cable from the card.
3. Holding the card by the top corners, gently pull up the card and remove it from its expansion slot.

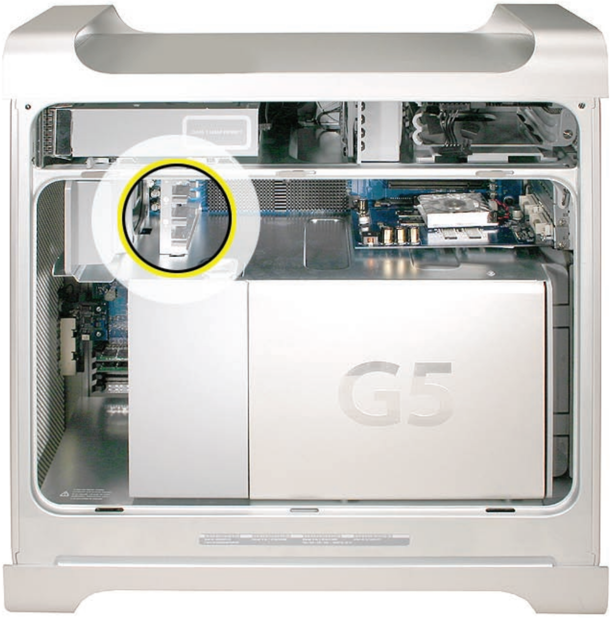


Replacement Note: When replacing the Quadro FX 4500 card, position the card over the slot by carefully aligning the end of the card in the first slot in the PCI card guide and the two screw holes in the card fence with the first two PCI card screw holes in the enclosure. Then press down.

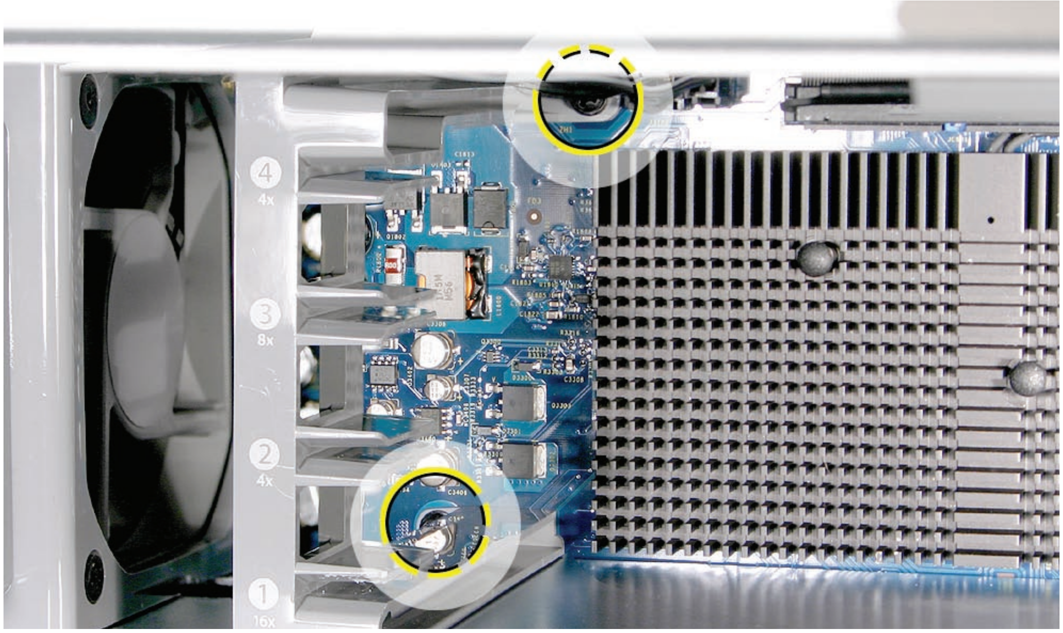


To remove the Quadro FX 4500 cable, do the following:

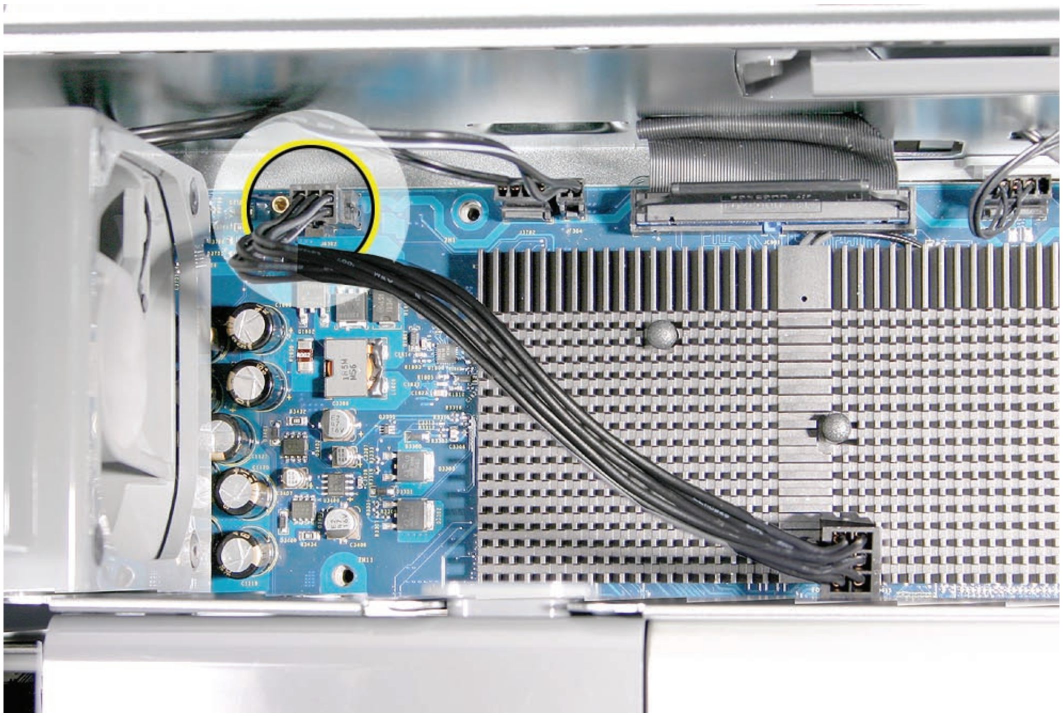
1. Remove the Quadro FX 4500 card from the enclosure (refer to preceding steps).
2. Locate the PCI card guide.



3. Remove the two screws that mount the PCI card guide to the logic board.
4. Slide the card guide up to release the two latches from the PCI divider, and remove the card guide from the enclosure.



5. Disconnect the Quadro FX 4500 cable from the logic board and remove the cable from the enclosure.



Battery

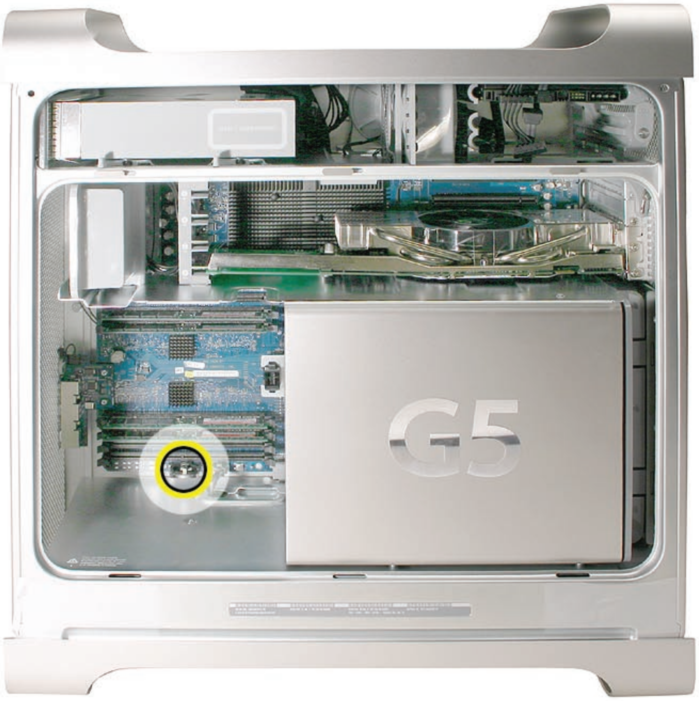
Tools

No tools are required for this procedure. You may, however, find a flat-blade screwdriver useful in removing the battery from its holder.

Preliminary Steps

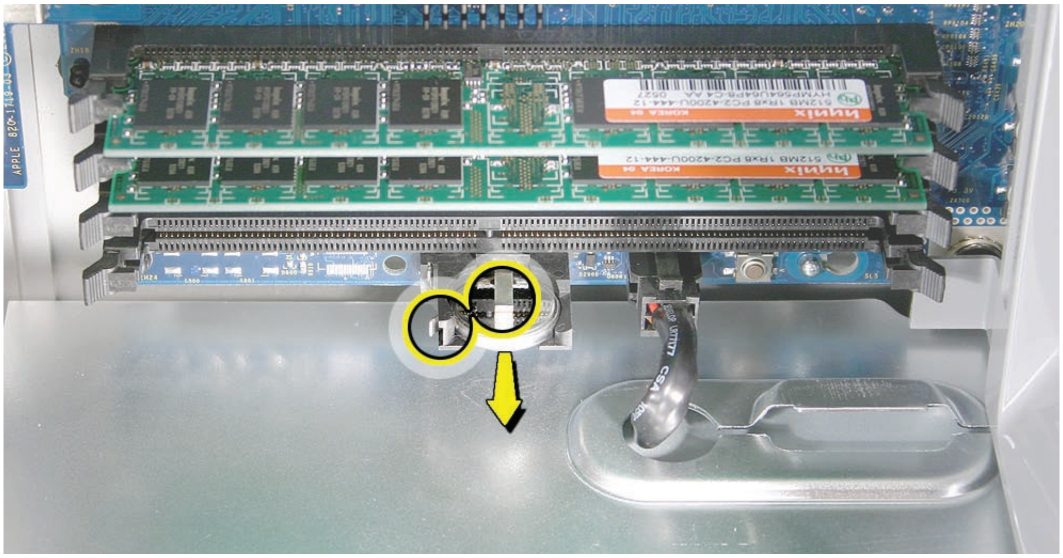
Before you begin, open the computer, lay it on its side with the access side facing up, and **remove the front inlet fan assembly**. If a memory DIMM is installed in the slot next to the battery, **remove the DIMM**.

Part Location

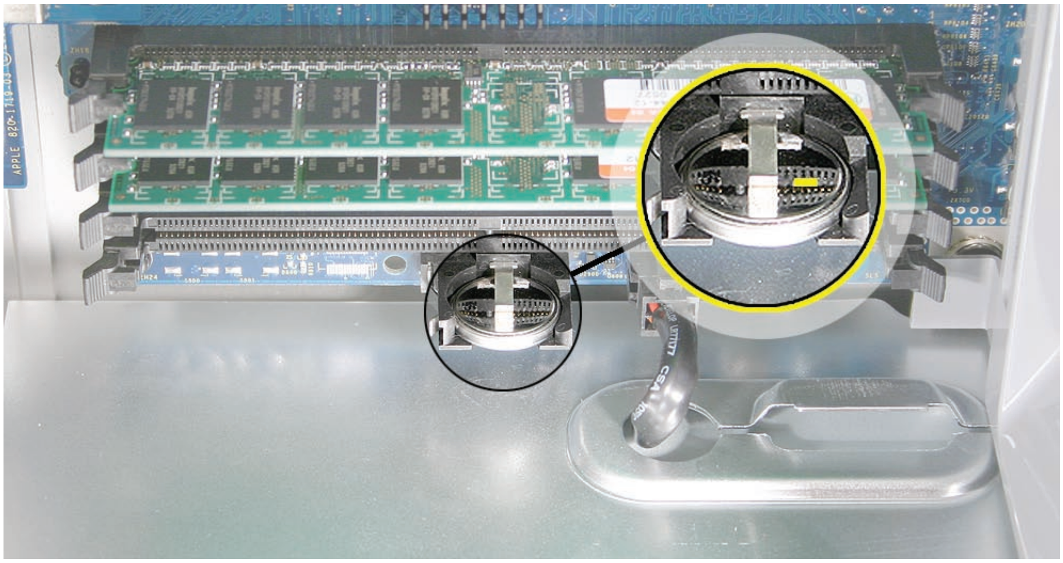


Procedure

1. If necessary, carefully spread the two tabs holding the battery.
2. Remove the battery from its holder.



Replacement Note: Insert the new battery in the holder, making sure the battery's negative symbol (–) faces up.



Warning: Installing the battery incorrectly may cause an explosion. Be sure the battery's positive and negative sides are correctly oriented in the holder. Use only the same type of battery or an equivalent recommended by the manufacturer of the original.

Important: Batteries contain chemicals, some of which may be harmful to the environment. Please dispose of used batteries according to your local environmental laws and guidelines.

AirPort Express/Bluetooth Combo Card and Runway Card

Note: The combo card is connected to an adapter card called the runway card. This procedure includes steps for removing both the combo and runway cards. However, if you are replacing just the combo card, it is not necessary to remove the runway card from the enclosure.

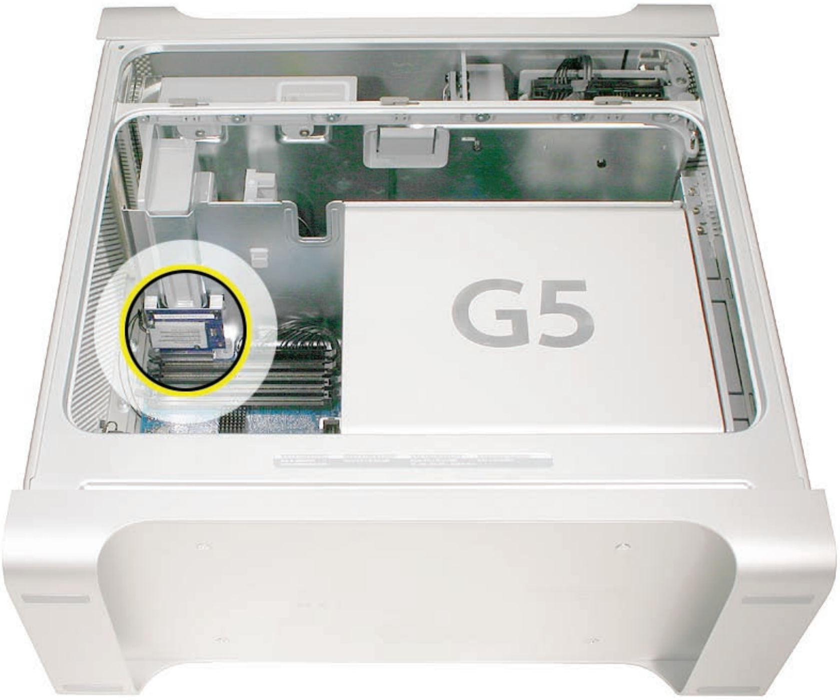
Tools

The only tools required for this procedure are a jeweler's Phillips #0 screwdriver and Xacto knife.

Preliminary Steps

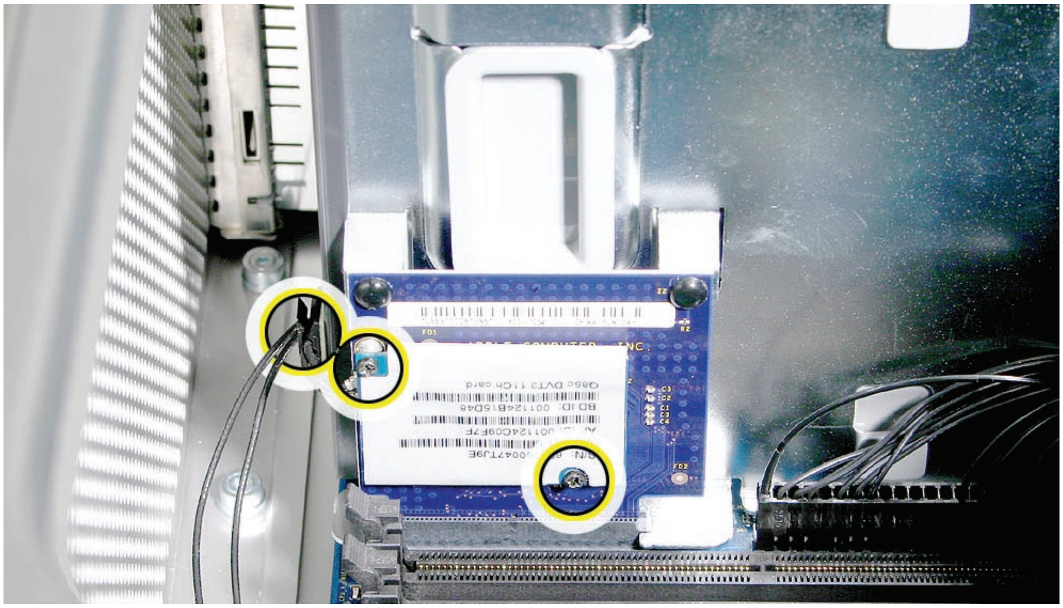
Before you begin, open the computer, lay it on its side with the access side facing up, and remove the front inlet fan assembly. If a memory DIMM is installed in the slot next to the combo card, remove the DIMM.

Part Location

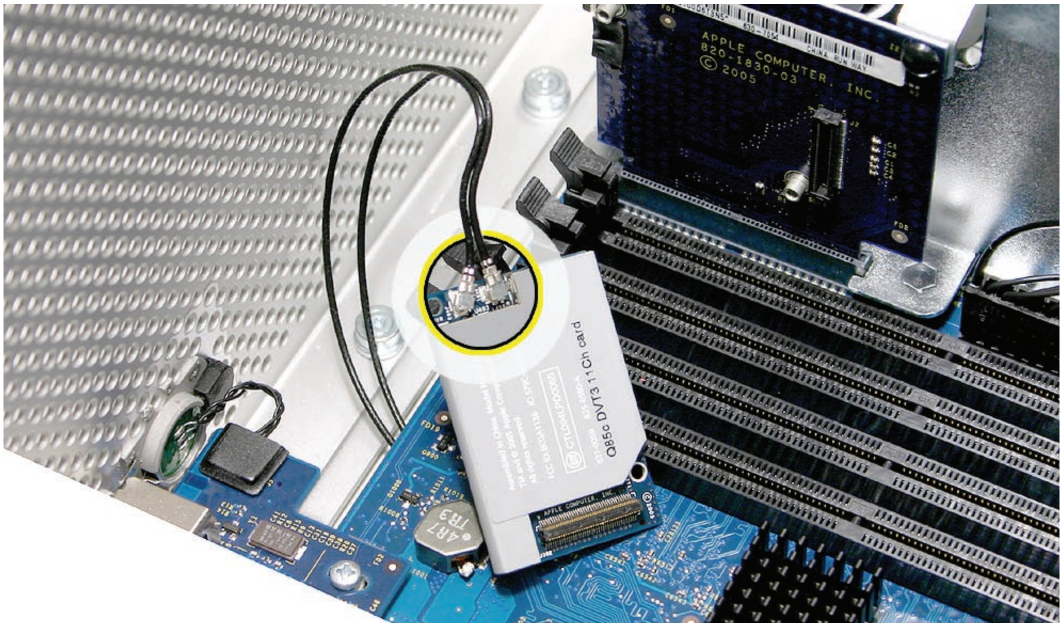


Procedure

1. Using a jeweler's Phillips screwdriver, remove the two combo card mounting screws.
2. Disconnect the combo card antennas from the clip on the side of the PCI divider.



3. Disconnect the combo card from the runway card and lift up a short distance.
4. Disconnect the two antenna cables from the card and remove the card from the enclosure.

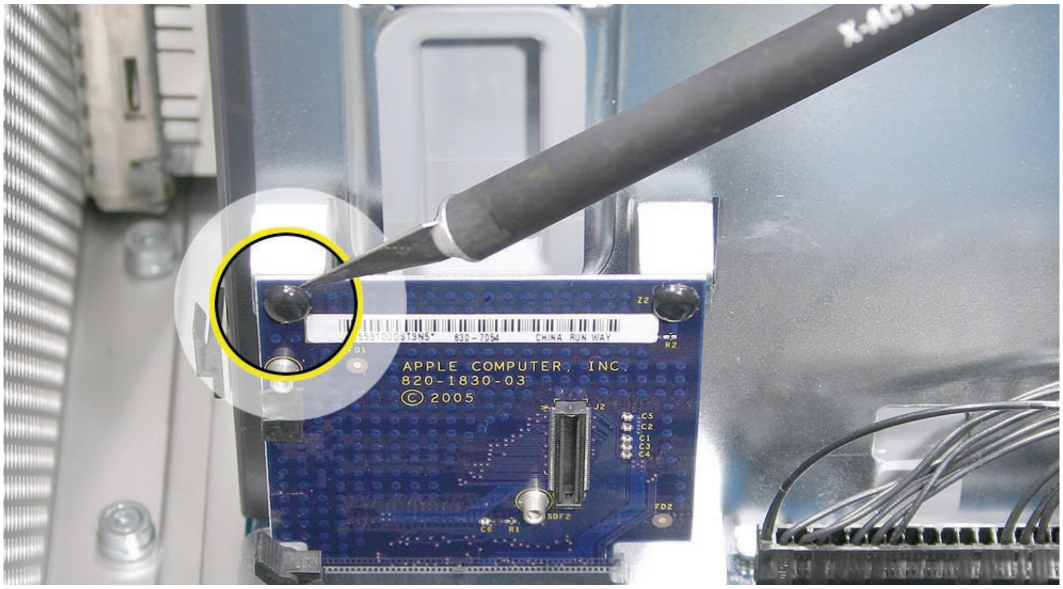


Replacement Note: The cables can attach to either connector on the card.

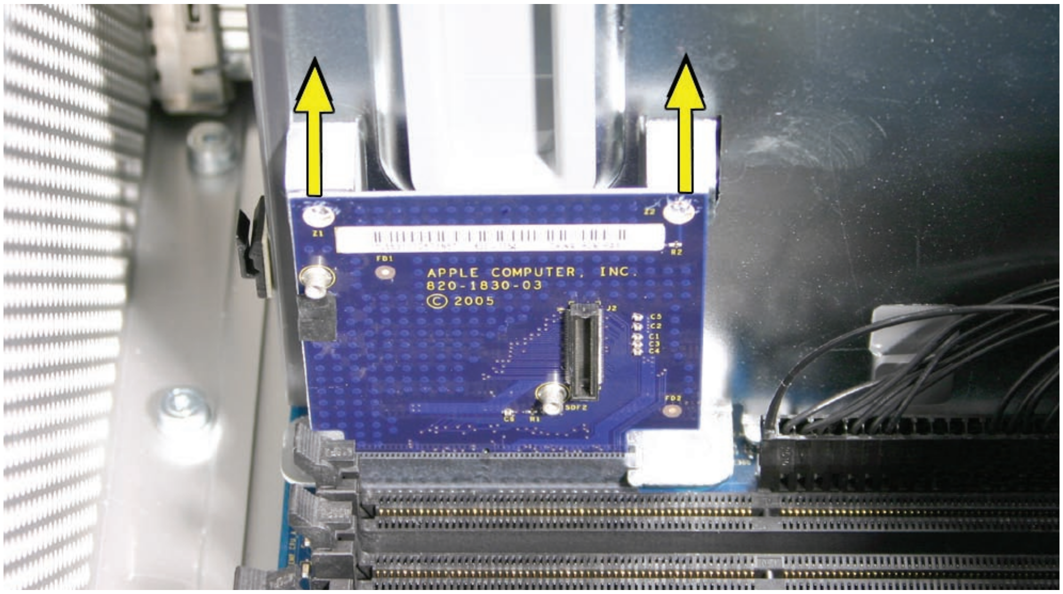
To remove the runway card (after removing the combo card), do the following:

Note: The runway card is attached to the PCI divider by two black rivets. You must remove the rivets before disconnecting the card from the logic board.

1. Using a Xacto knife, pry up and remove the center plug of the first black rivet. Then pry up and remove the outer casing for the rivet.



2. Repeat for the second rivet.
3. Holding the runway card by its top edge, pull straight up to disconnect the card from the logic board.



PCI Card Guide

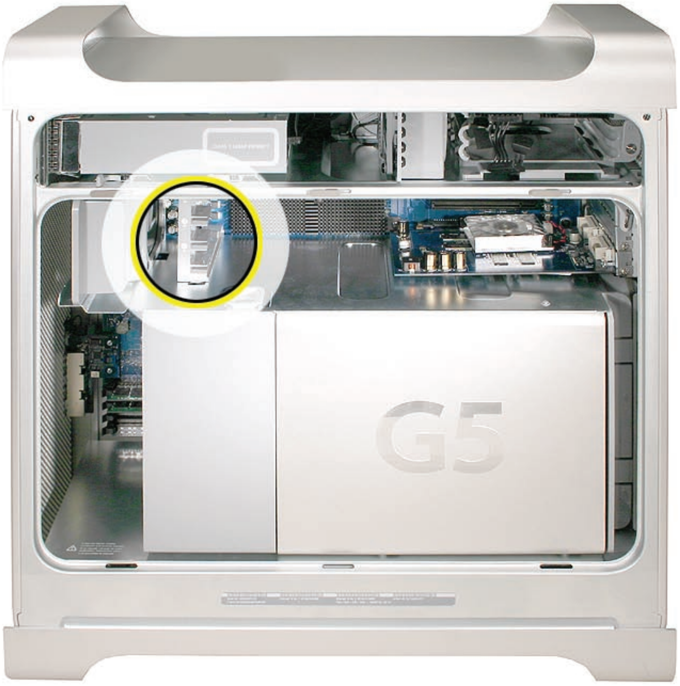
Tools

The only tool required for this procedure is a Phillips #1 screwdriver.

Preliminary Steps

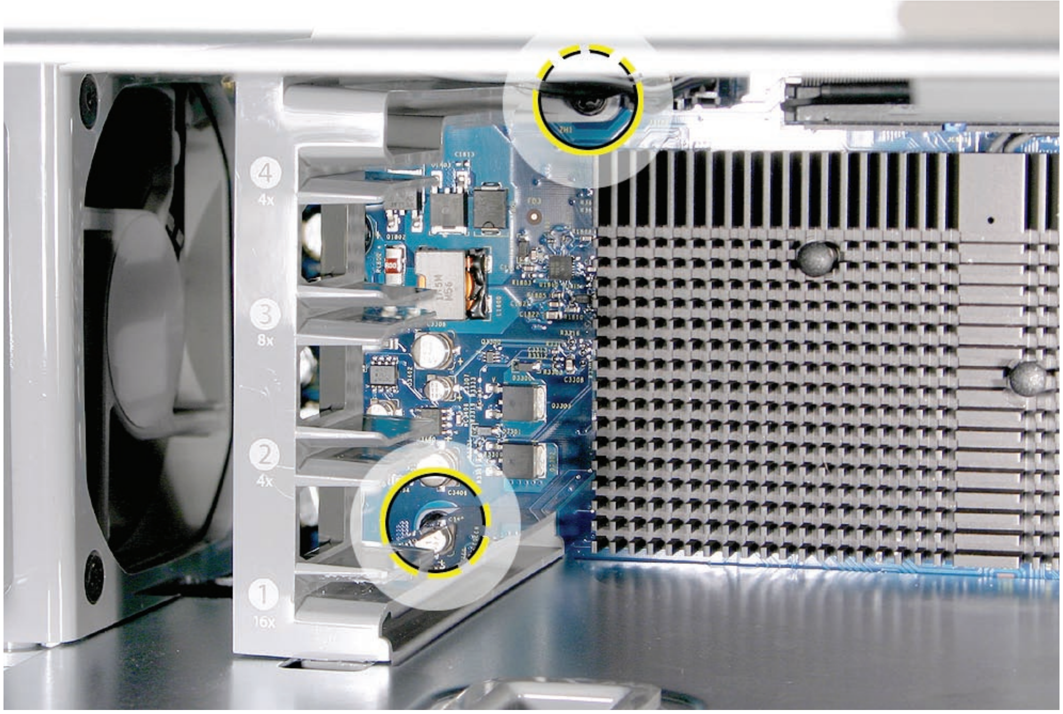
Before you begin, open the computer, lay it on its side with the access side facing up, and **remove any 12-inch graphics or PCI Express cards**.

Part Location



Procedure

1. Remove the two screws that mount the PCI card guide to the logic board.
2. Slide the card guide up to release the two latches from the PCI divider, and remove the card guide from the enclosure.



Speaker/Fan Assembly

Tools

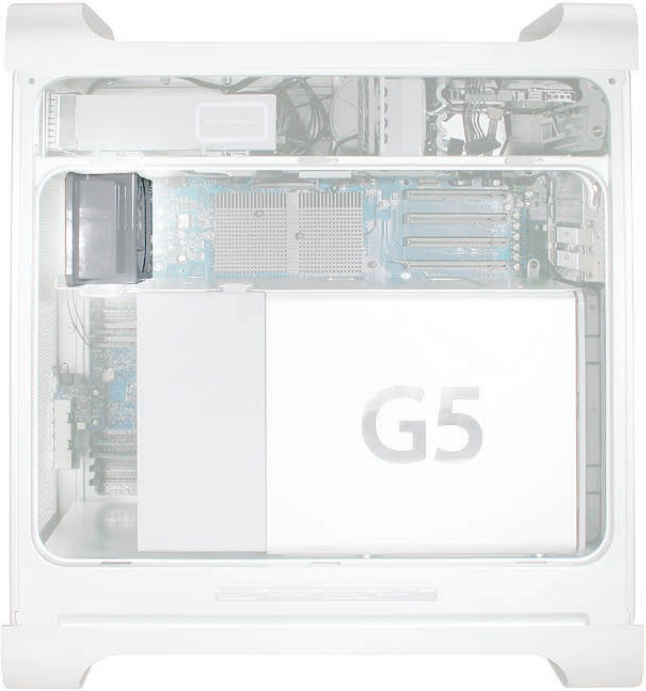
No tools are required for this procedure.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

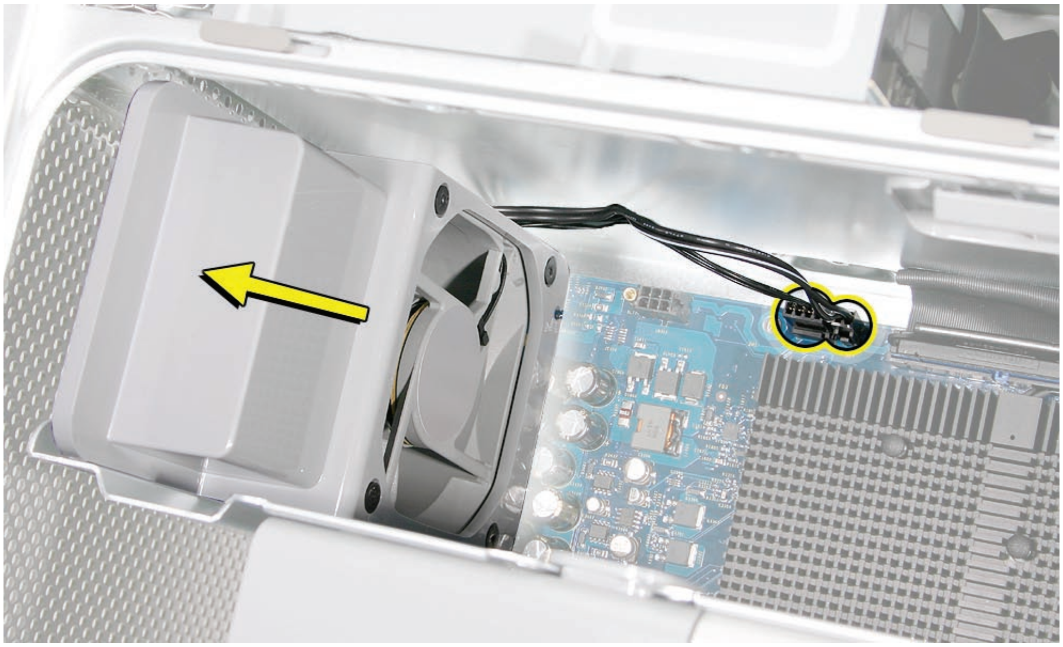
- Any 12-inch graphics or PCI Express cards
- PCI card guide.

Part Location

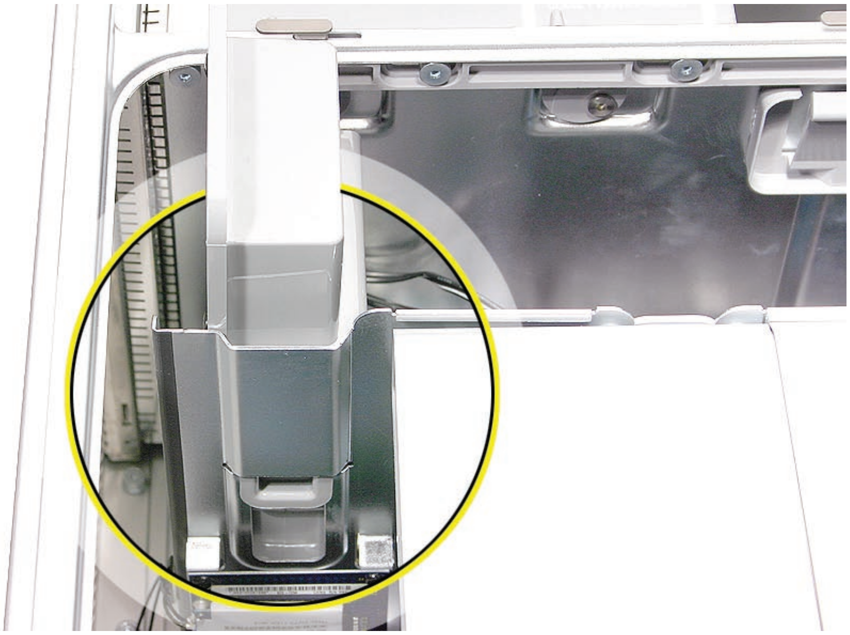


Procedure

1. Disconnect the speaker and fan cables from the logic board.
2. Lift the speaker/fan assembly straight up and remove it from the enclosure.
   Important: Be careful that the fan and speaker cables do not catch on the PCI divider as you lift the assembly.



Replacement Note: When reinstalling the speaker/fan bracket in the enclosure, make sure the large tab on the side of bracket engages with the channel in the PCI divider.



Ambient Board

Tools

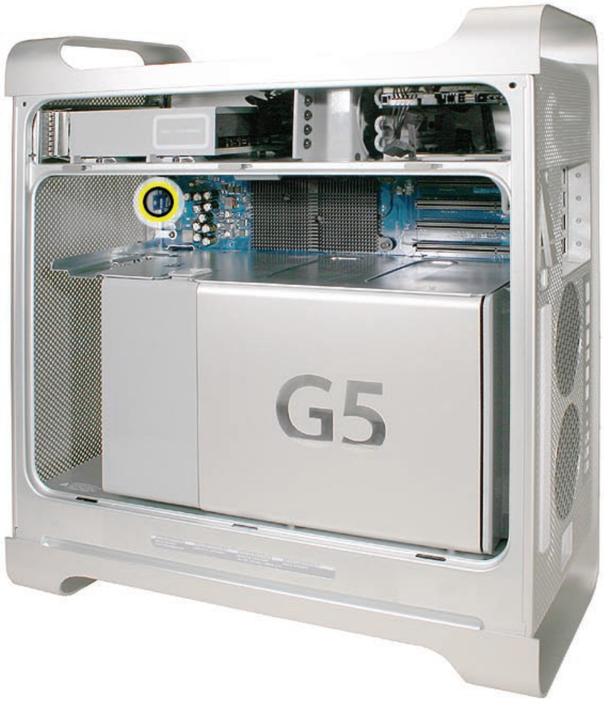
No tools are required for this procedure.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

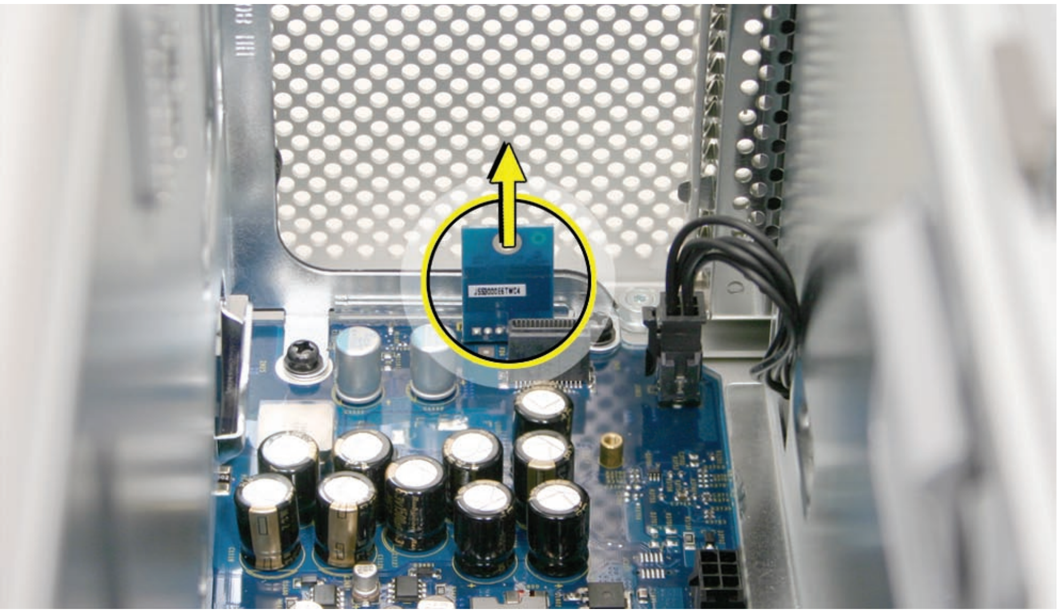
- Any 12-inch graphics or PCI Express cards
- PCI card guide
- Speaker/fan assembly

Part Location



Procedure

1. Locate the ambient board connected to the logic board.
2. Position your fingers on both sides of the board. Gently rock the board from side-to-side, pulling it straight up and out of the connector.



Heatsink Cover

Warning: If you are not certified to service this product, removing the heatsink cover will void the computer's warranty.

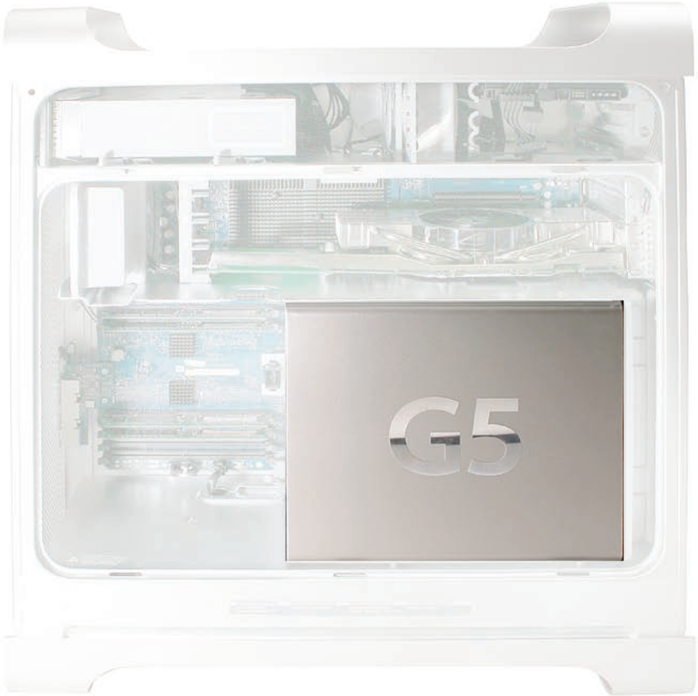
Tools

The only tool required for this procedure is a Xacto knife.

Preliminary Steps

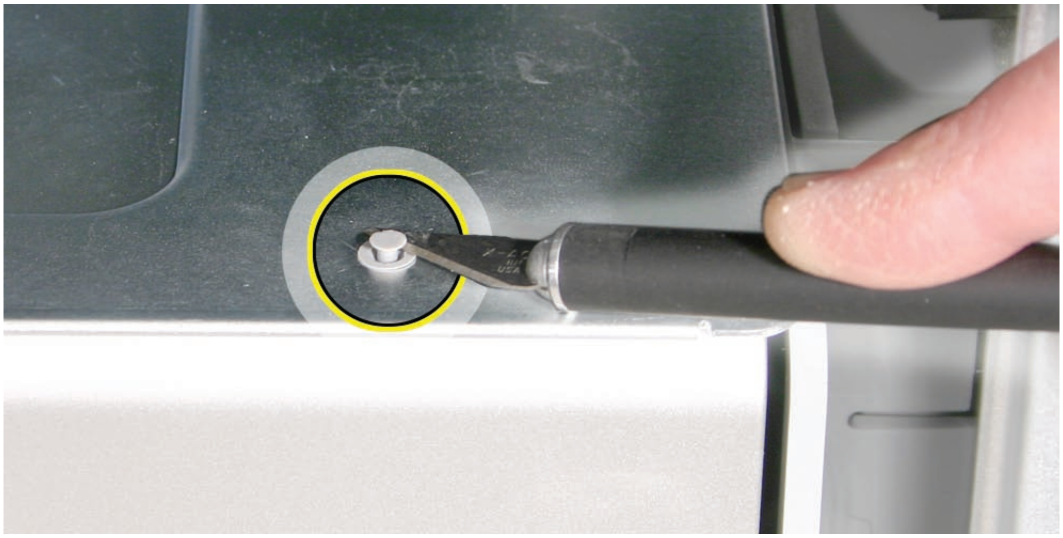
Before you begin, open the computer, lay it on its side with the access side facing up, and remove the front inlet fan assembly.

Part Location

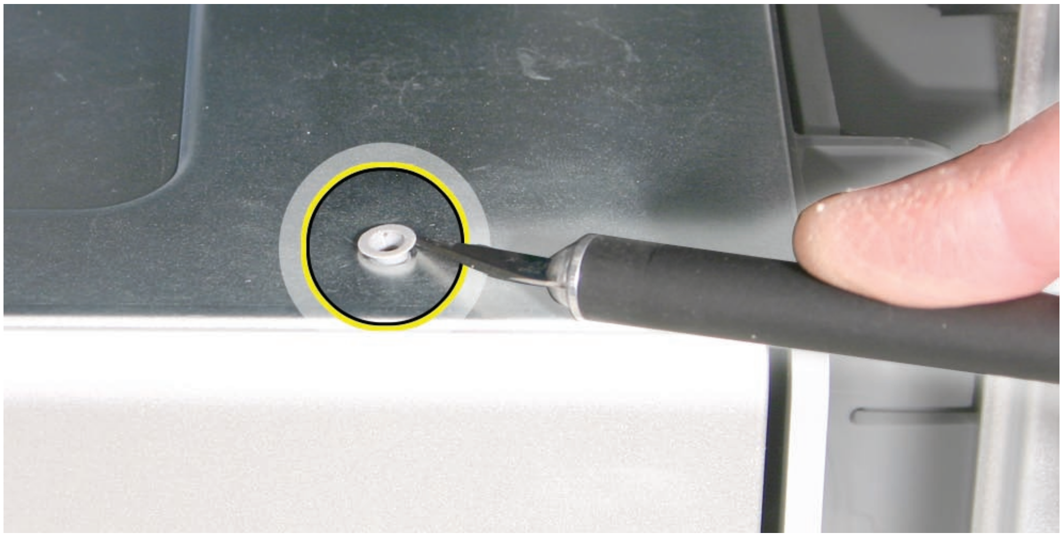


Procedure

1. Locate the locking rivet that secures the processor heatsink cover to the PCI divider.
2. Using a Xacto knife, pry up and remove the plug at the center of the locking rivet.

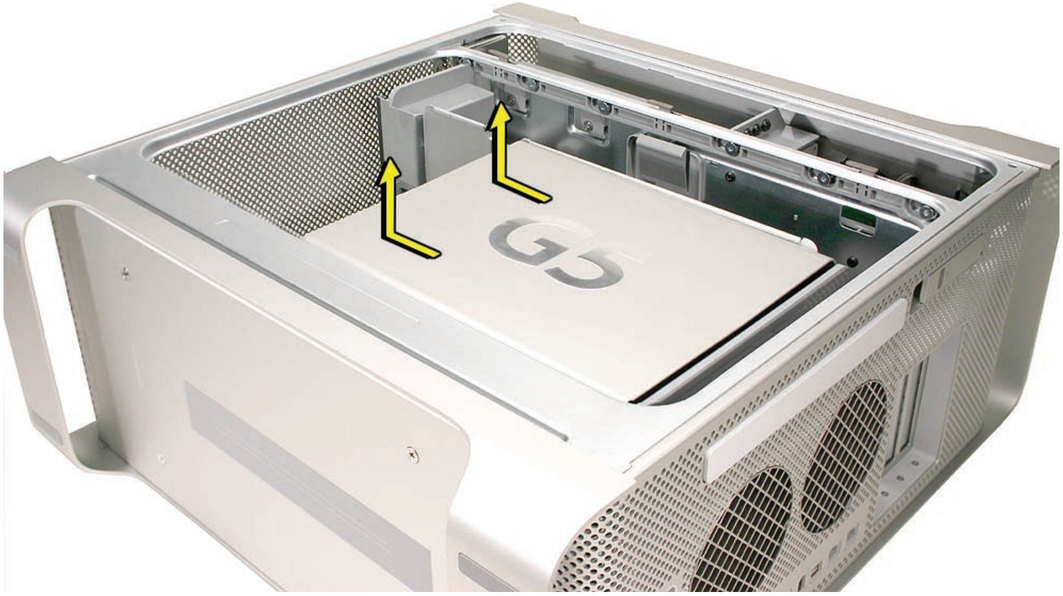


3. Pry up and remove the outer casing for the rivet.

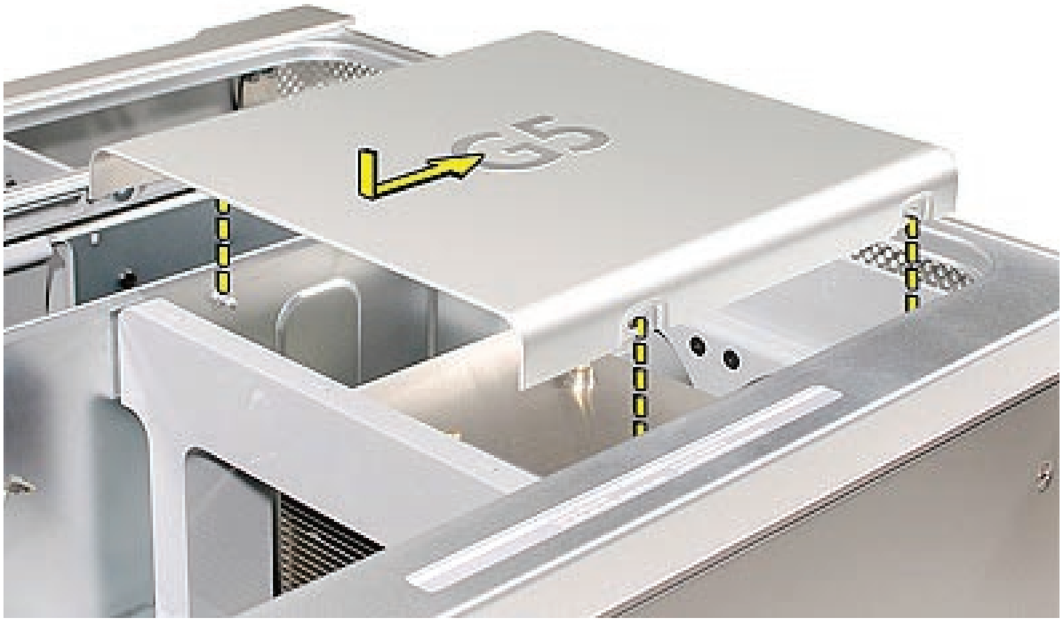


Replacement Note: For Power Mac G5 (Late 2005 Dual) computers, you do not need to replace the rivet after you have replaced the heatsink cover. For Power Mac G5 (Late 2005 Quad), you must replace the rivet. Extra rivets are available as part number 922-6503.

4. Slide the cover to the left to unlatch the four metal latches under the cover. Then lift the cover up and off the heatsink.



Replacement Note: Place the notches in the underside of the cover directly over the four mounting pegs. Slide the cover toward the back of the computer and then press down firmly until you feel the cover lock into place.



Rear Exhaust Fan Assembly

Tools

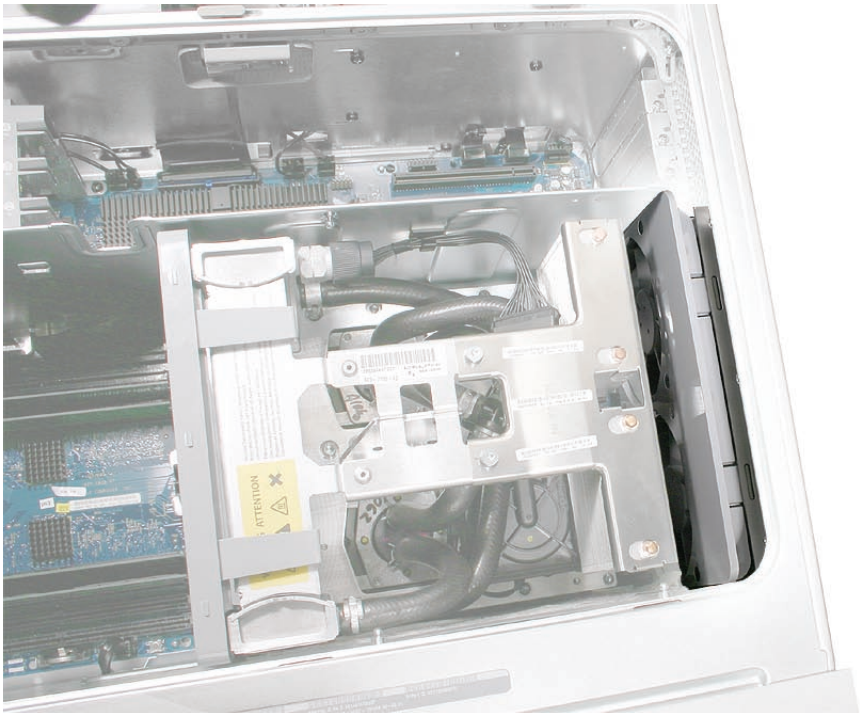
The only tools required for this procedure are a Phillips #1 screwdriver and a flatblade screwdriver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

- Front inlet fan assembly
- All graphics and PCI Express cards
- Heatsink cover

Part Location

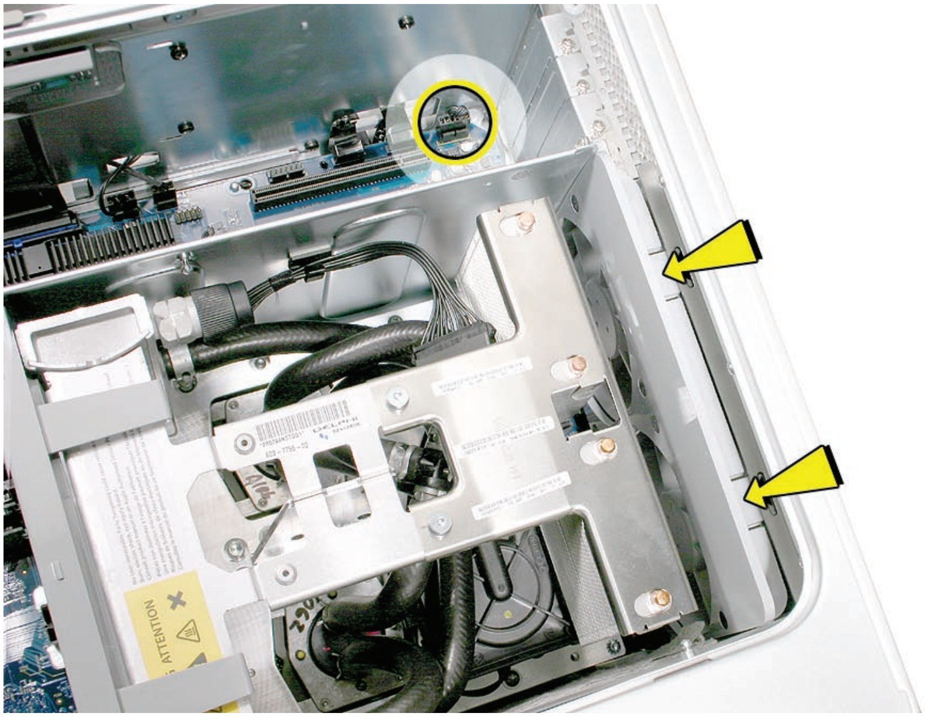


Procedure

1. Disconnect the fan cable from the logic board.

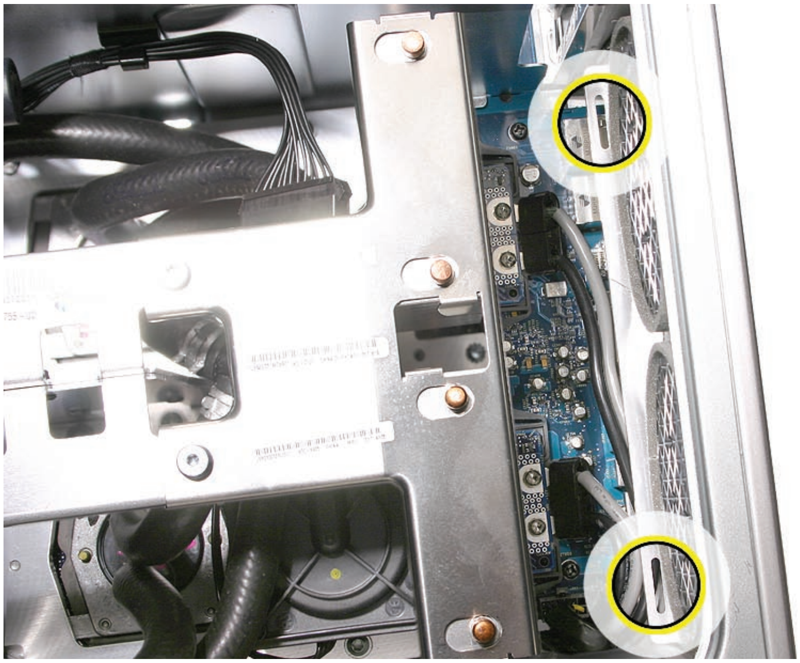
   Note: Press the cable connector up toward the media shelf when disconnecting the cable.

2. Press down on the two tabs on the top of the fan bracket to release the two latches.

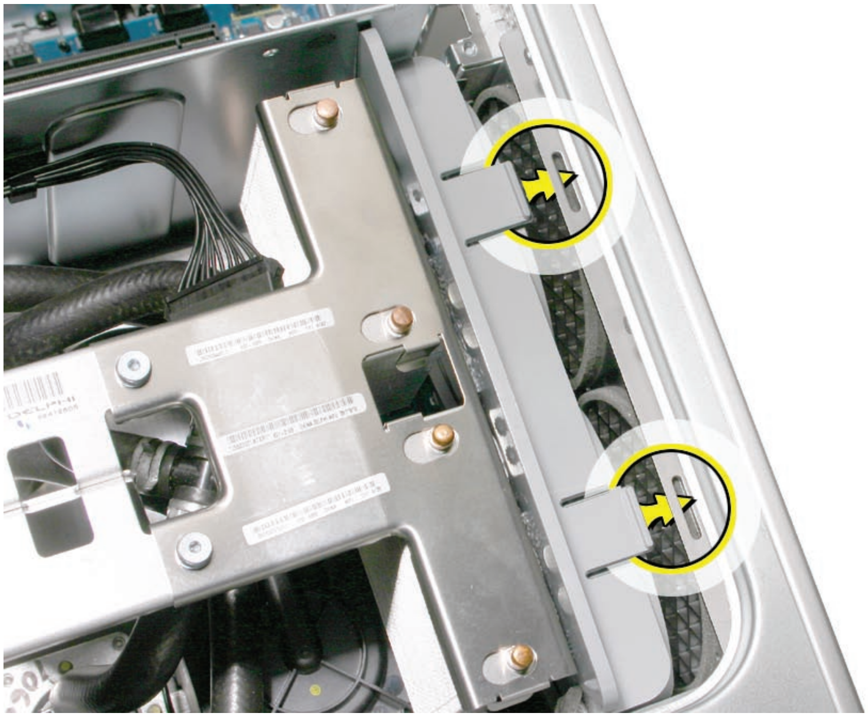


3. Lift the fan bracket and fans out of the enclosure.

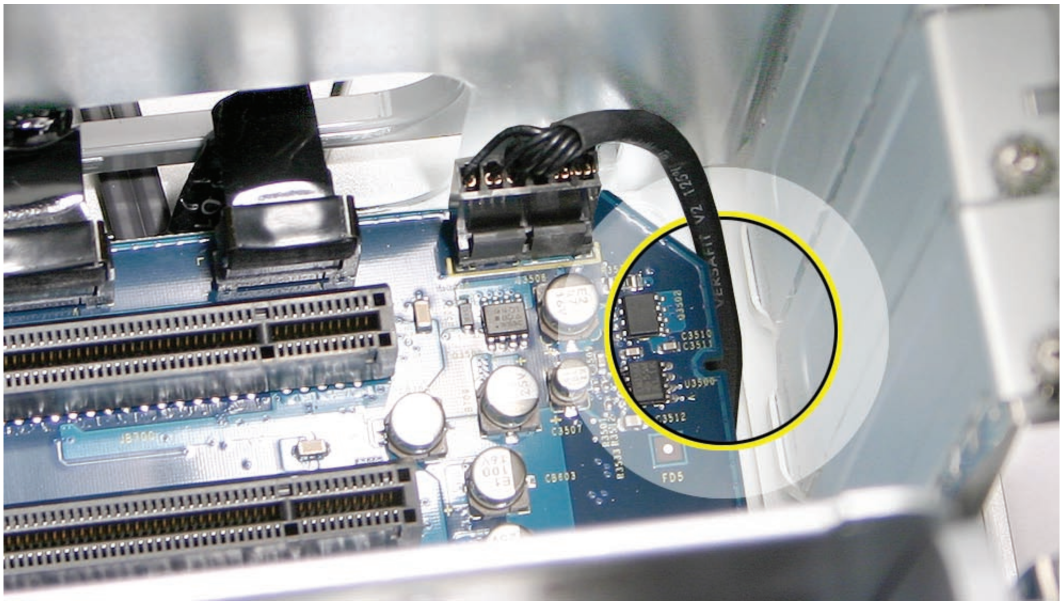
Replacement Note: When reinstalling the fan bracket in the enclosure, make sure the two tabs on the bottom of the bracket engage with the slots in the enclosure's fan guide.



Then rotate the fan back flush with the rear panel, making sure the two latches on the top of the bracket engage with the two slots on the top of the fan guide.



Replacement Note: Using a flatblade screwdriver, tuck the fan cable under the edge of the logic board.



PCI Divider

Tools

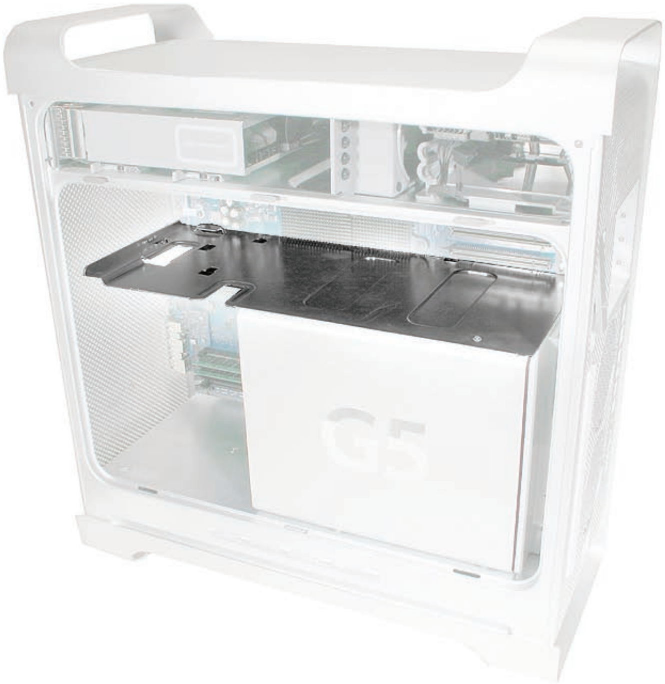
The only tools required for this procedure are a Phillips #1 screwdriver and Xacto knife.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

- Front inlet fan assembly
- All graphics and PCI Express cards
- PCI card guide
- Speaker/fan assembly
- Heatsink cover

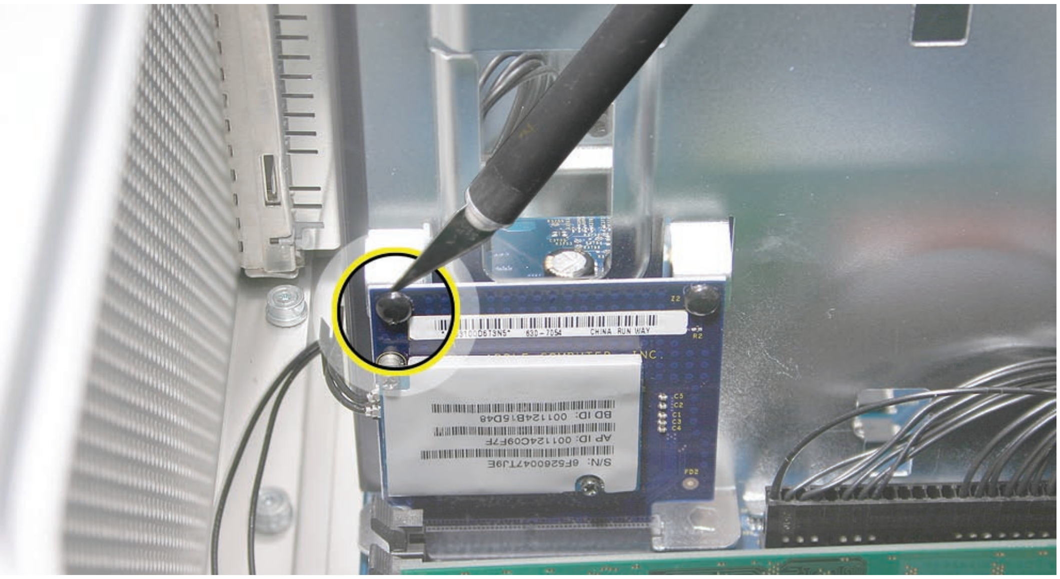
Part Location



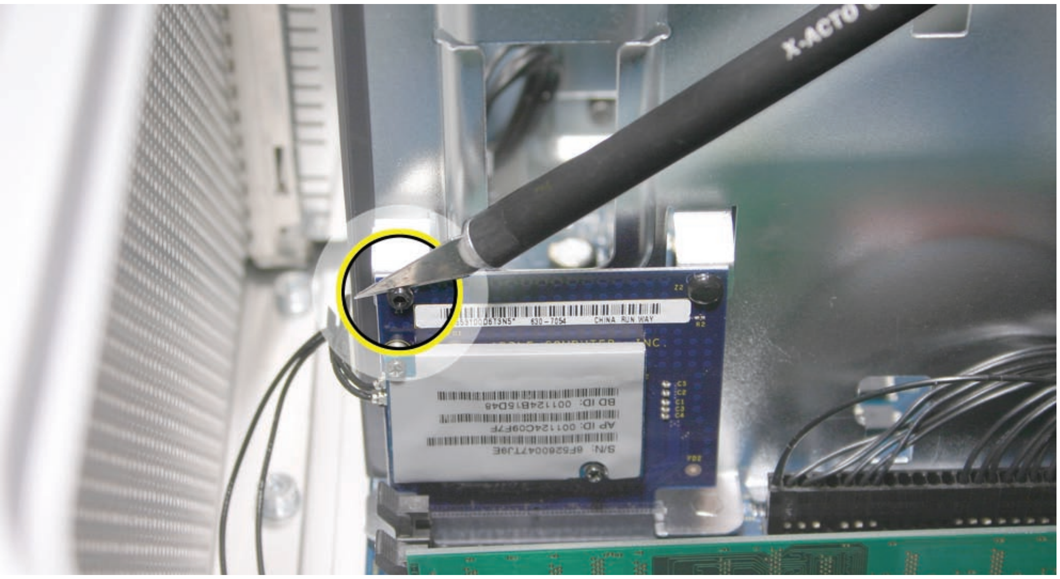
Procedure

Note: The combo card's runway card is attached to the PCI divider by two black rivets. Before you can remove the card from the PCI divider, you must remove both rivets and disconnect the card from the logic board. You do not, however, have to remove the runway card or combo card from the enclosure.

1. Using a Xacto knife, pry up and remove the center of the first black rivet that mounts the runway card to the PCI divider.

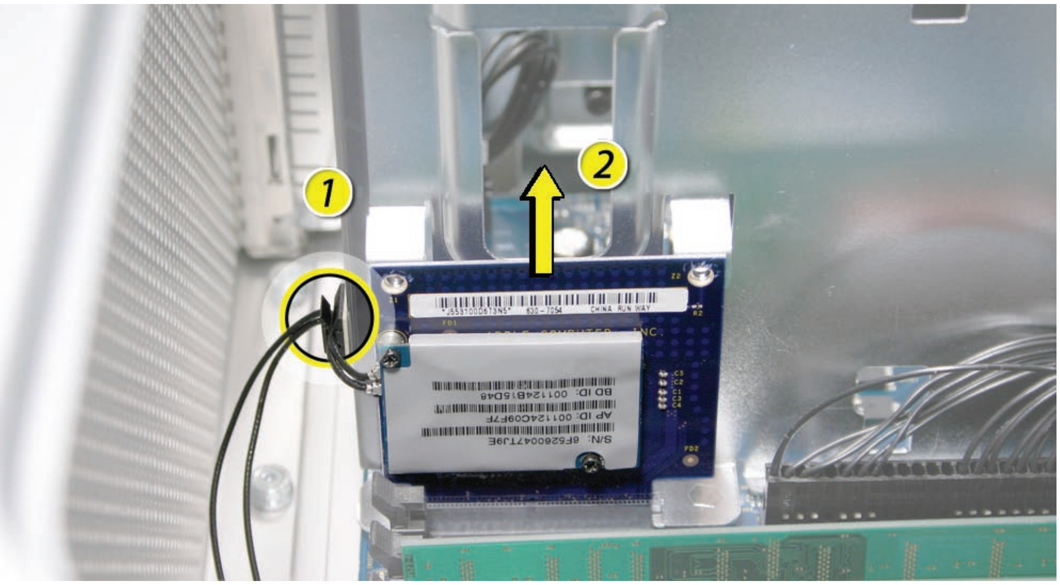


2. Pry up and remove the outer casing for the rivet.

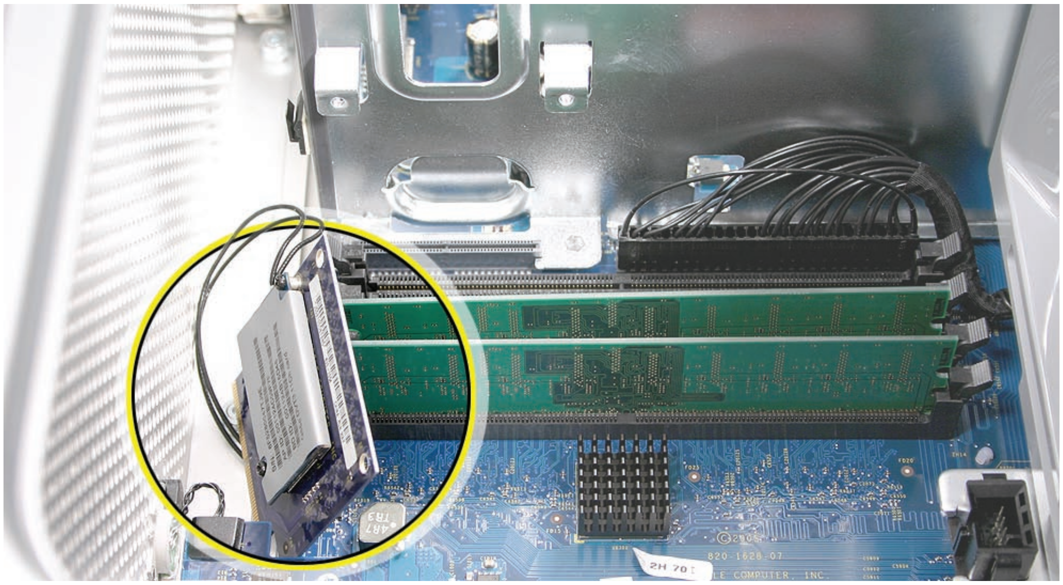


3. Repeat steps 1 and 2 for the second rivet.

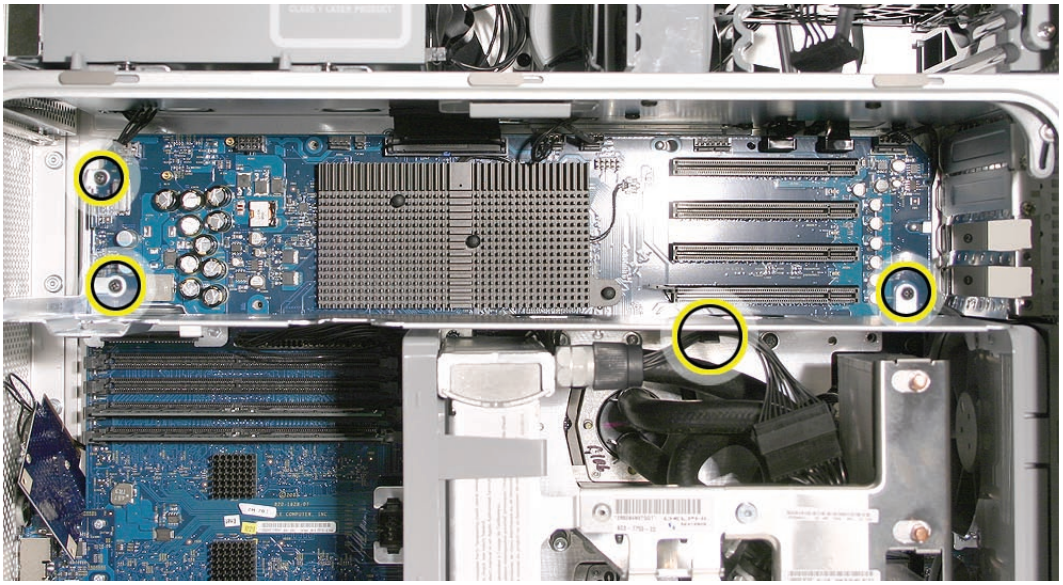
4. Remove the combo card antenna cables from the clip on the side of the PCI divider.
5. Holding the runway card by its top edge, pull straight up to disconnect the card from the logic board.



6. Set the runway card (with combo card attached) to the side. (There is no need to remove the runway card from the enclosure.)

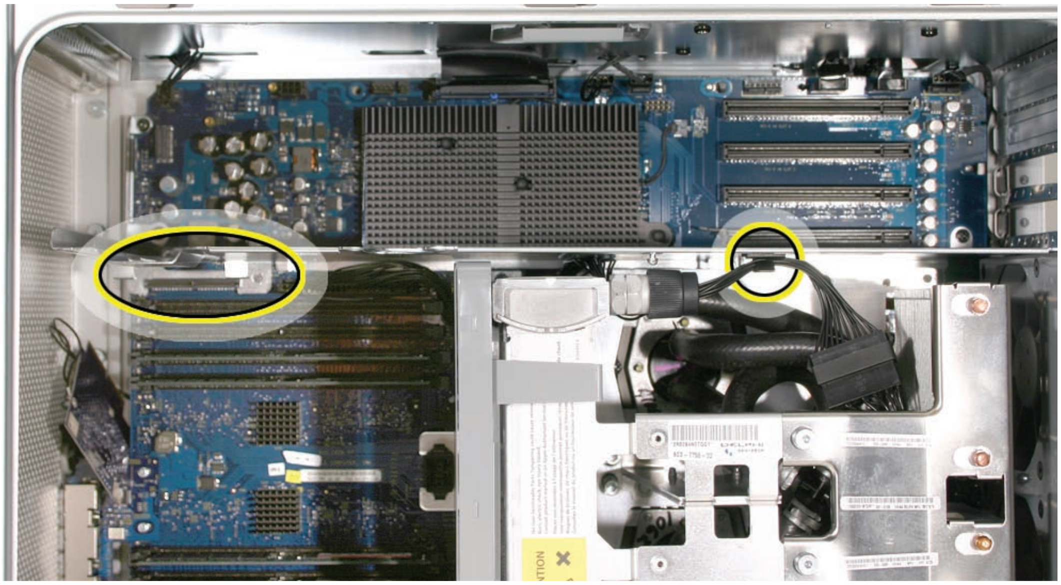


7. Remove the processor heatsink cable from the clip on the PCI divider.
8. Remove the three black PCI divider mounting screws.



9. Lift the PCI divider out of the enclosure.

Replacement Note: Align the PCI divider on the logic board by placing it over the runway card connector. Be sure to replace the processor heatsink cable in the clip on the PCI divider.



Media Bay Fan

Tools

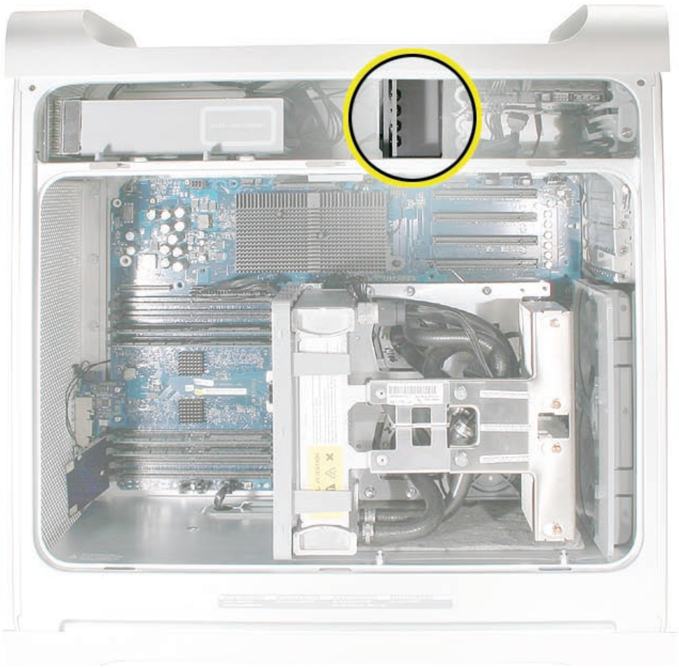
The only tool required for this procedure is a short-handled or right-angle Phillips #2 screwdriver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

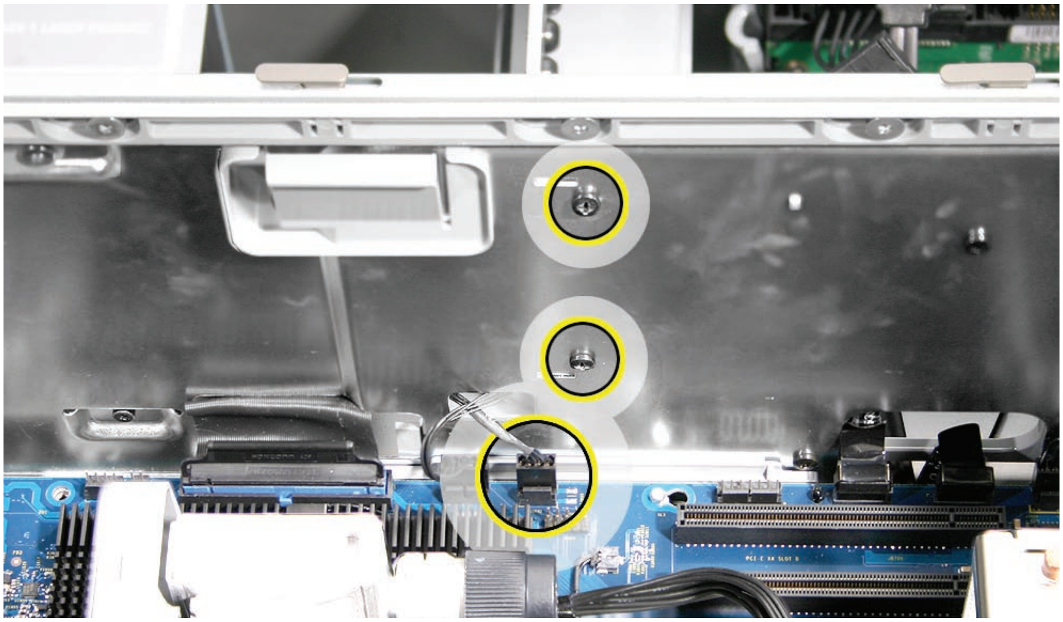
- Front inlet fan assembly
- All graphics and PCI Express cards
- PCI card guide
- Speaker/fan assembly
- Heatsink cover
- PCI divider

Part Location

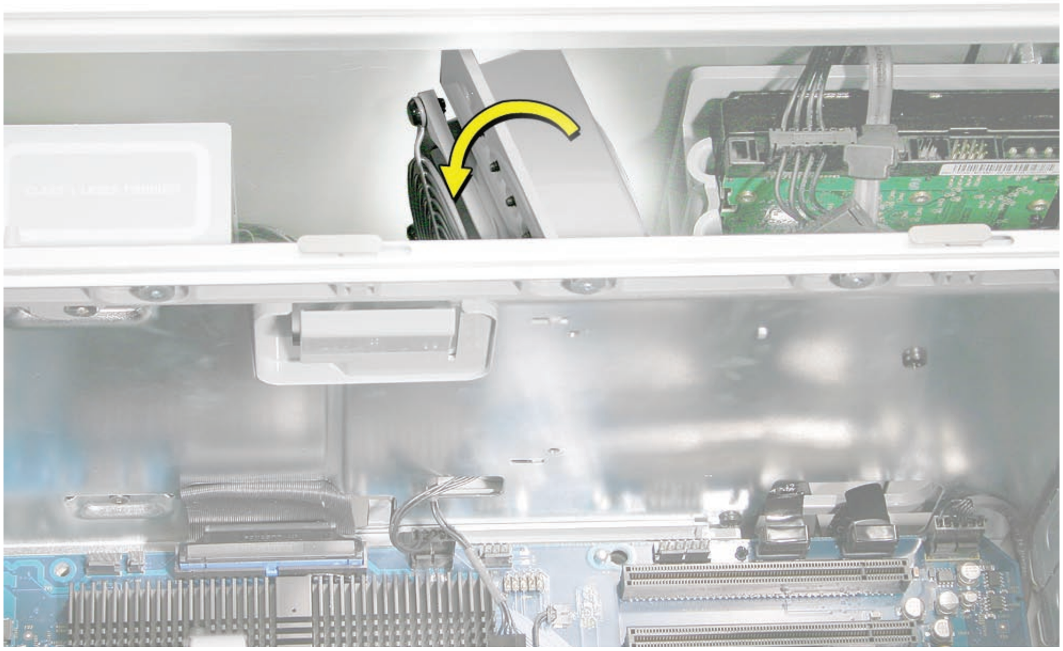


Procedure

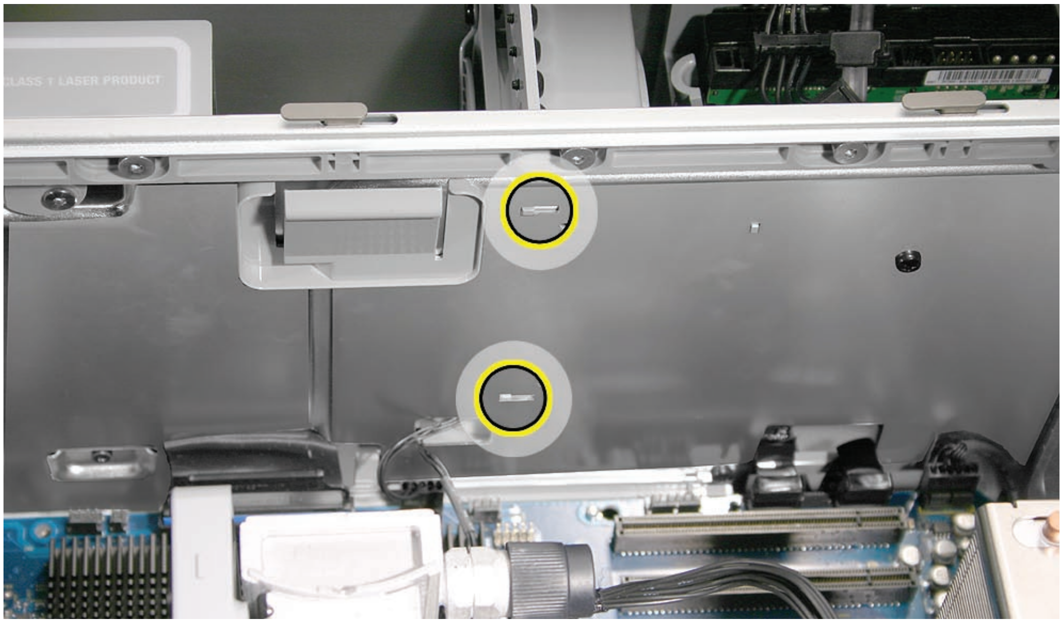
1. Disconnect the media bay fan cable from the logic board.
2. Remove the two media bay fan mounting screws.



3. Rotate the fan counterclockwise.
4. Route the fan cable out through the opening in the media bay shelf and remove the fan from the media bay.



Replacement Note: After placing the fan in the media bay, make sure the tabs on the bottom of the fan engage with the slots in the media bay shelf. Then rotate the fan clockwise back into position.



Processor Inlet Frame (Dual 2.0/2.3 GHz)

Tools

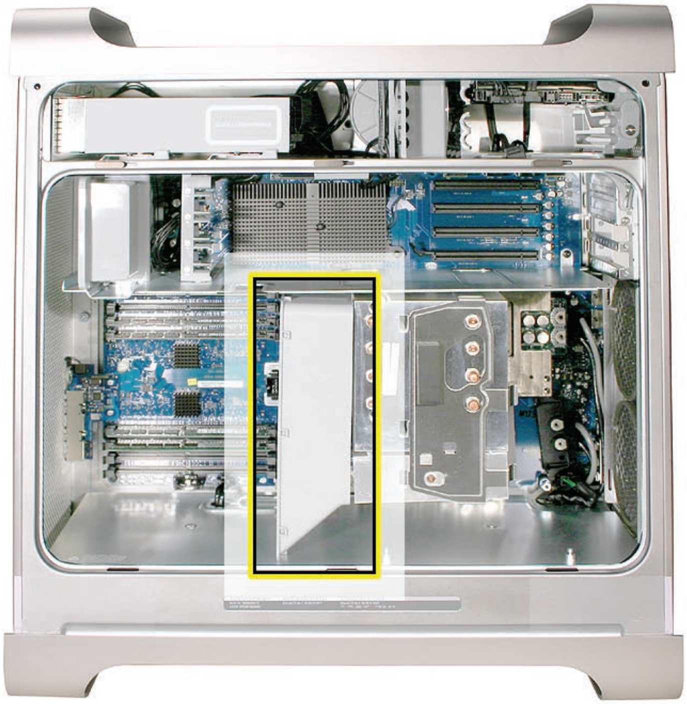
No tools are required for this procedure.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

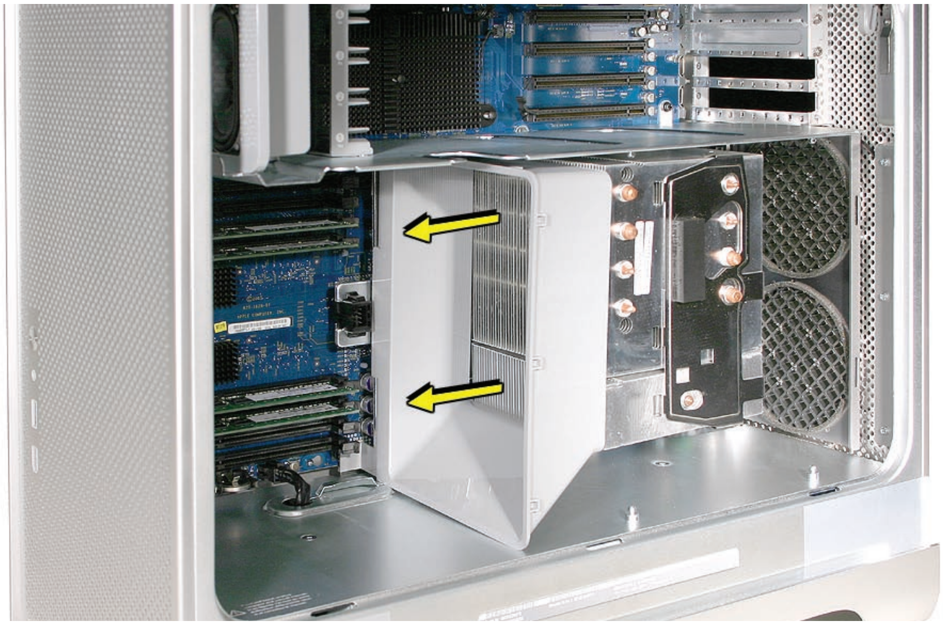
- Front inlet fan assembly
- Heatsink cover

Part Location

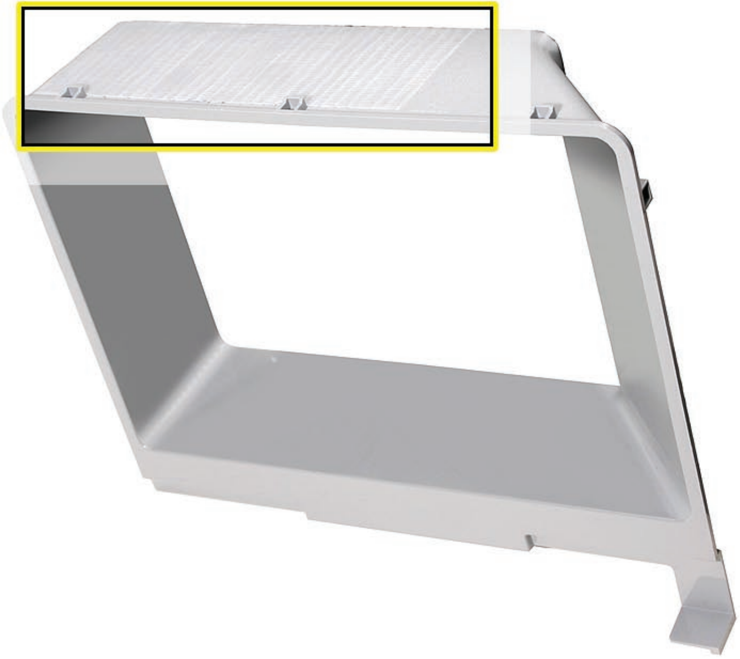


Procedure

1. Lift the processor inlet frame off the processor.
2. Remove the frame from the enclosure.



Replacement Note: If you are replacing the processor inlet frame with a new inlet frame on the Power Mac G5 (Late 2005 Dual 2.0 GHz/Dual 2.3 GHz) computer, check the replacement parts box for an enclosed label. Before installing the frame, apply the label to the frame as illustrated below.



Processor (Dual 2.0/2.3 GHz)

Tools

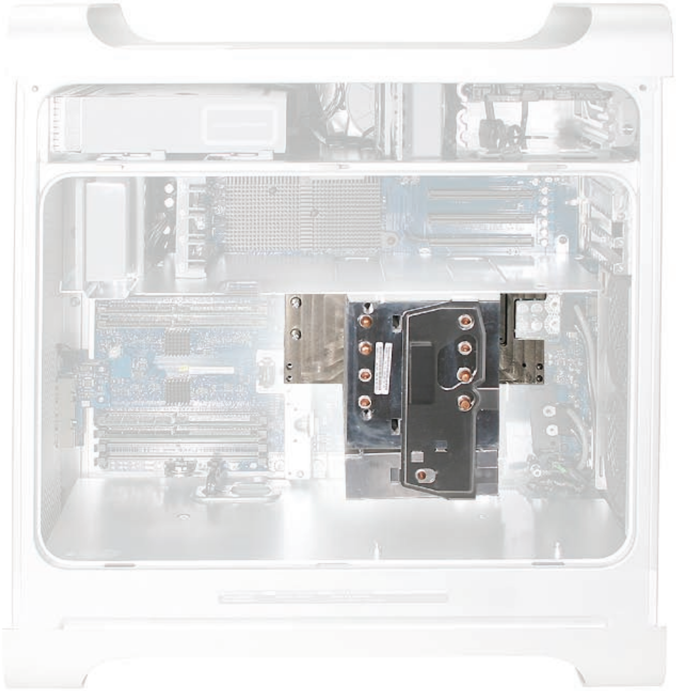
The only tools required for this procedure are a long-handled 3 mm flathead hex driver and a long-handled 4 mm ballhead hex driver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

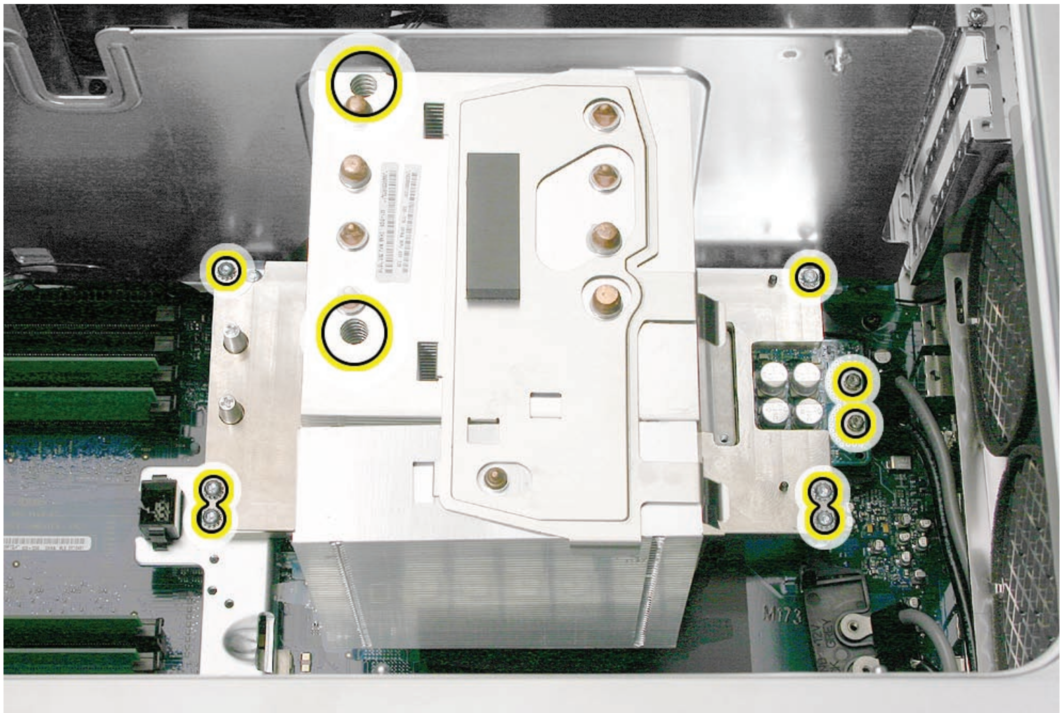
- Front inlet fan assembly
- All graphics and PCI Express cards
- Rear exhaust fan assembly
- Heatsink cover
- Processor inlet frame (Dual 2.0/2.3 GHz)

Part Location

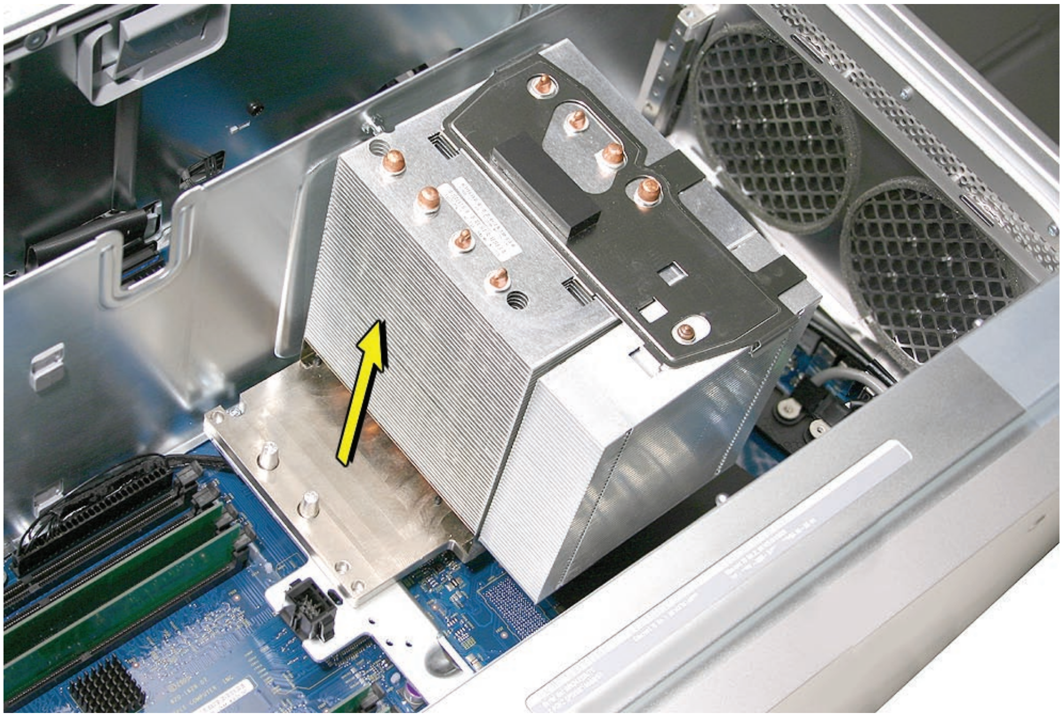


Procedure

1. Using a long-handled 3 mm flathead hex driver, remove the eight processor mounting screws. (Six long screws mount the upper platform and two short screws mount the power supply terminal on the level below.)
2. Insert a long-handled 4 mm ballhead hex driver into the two holes on the top of the heatsink and loosen (but do not remove) the two captive screws.



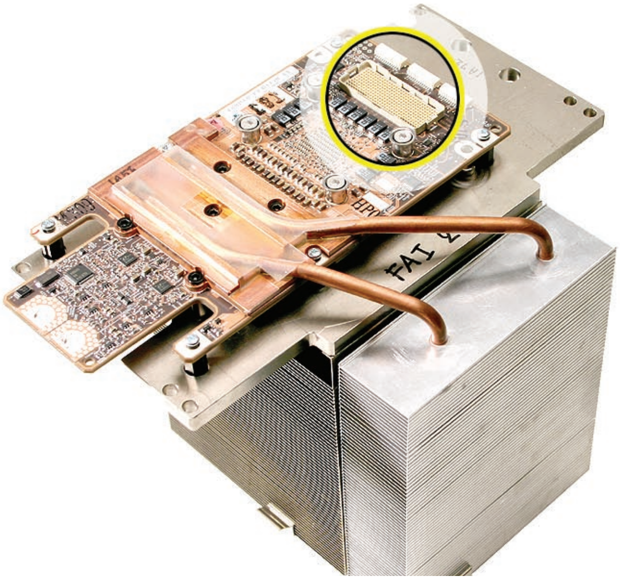
3. Holding the processor/heatsink by the bottom metal platform, lift the assembly straight up out of the enclosure.



Warning: The heatsink and processor are one unit. Do not attempt to separate the heatsink from the processor.

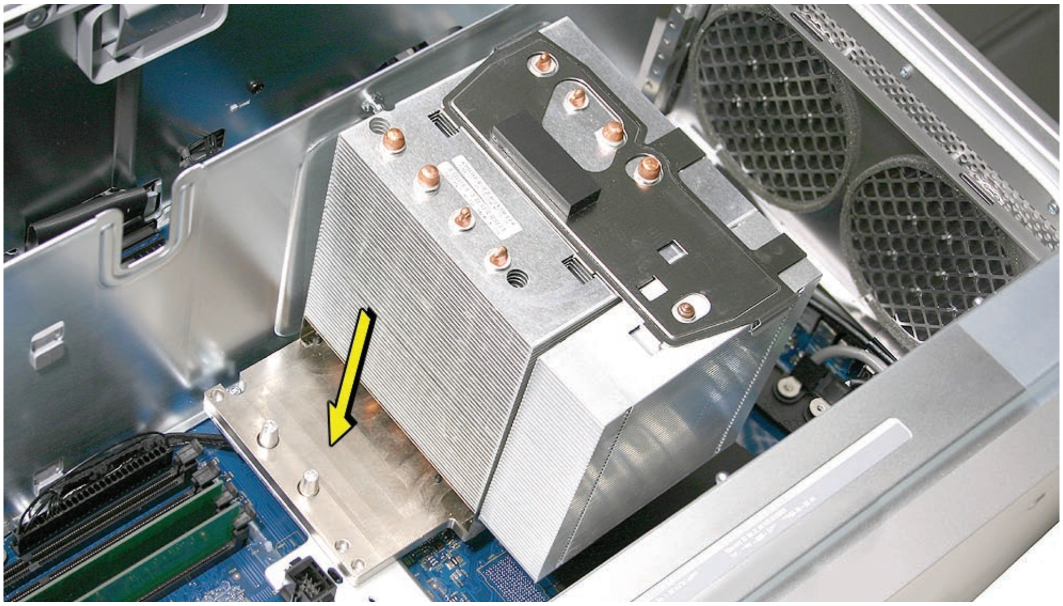
Replacement Procedure

1. If you are replacing the processor with a new processor, do the following:
    - When removing the new processor from its packaging, be careful to lift the processor straight up out of the box. Tilting the processor could damage the heatsink seal.
    - Before installing the processor, remove the cap over the processor connector.



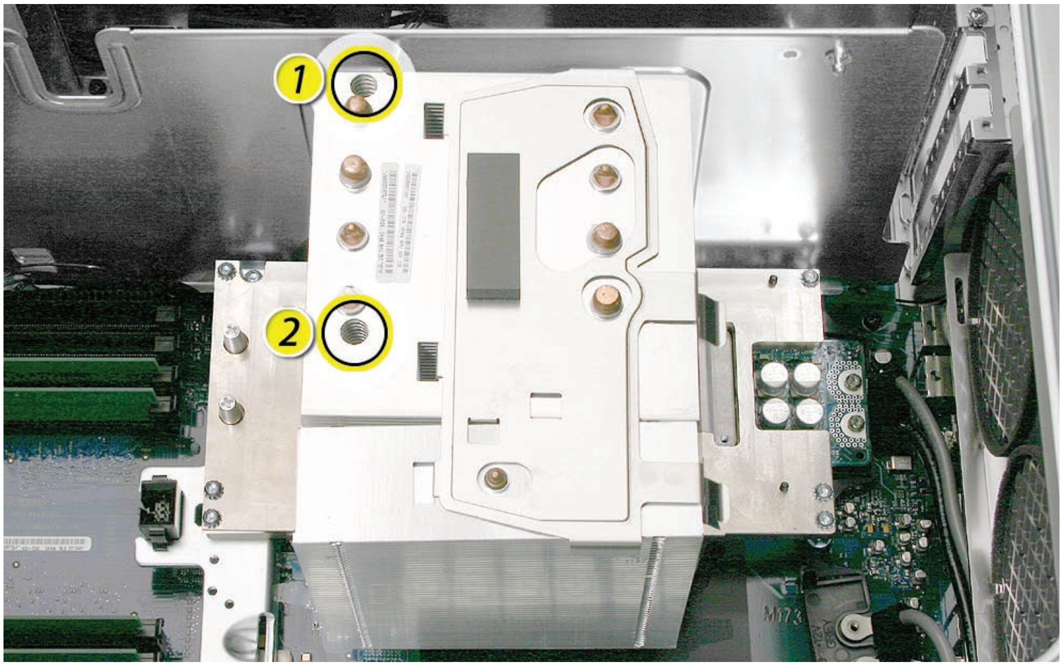
2. Lower the processor over the processor standoffs, and press down on the metal platform to make sure the processor is connected to the logic board. Gently rock the heatsink until it feels seated.

    Warning: Don't press on the top of the heatsink or you'll damage the processor.

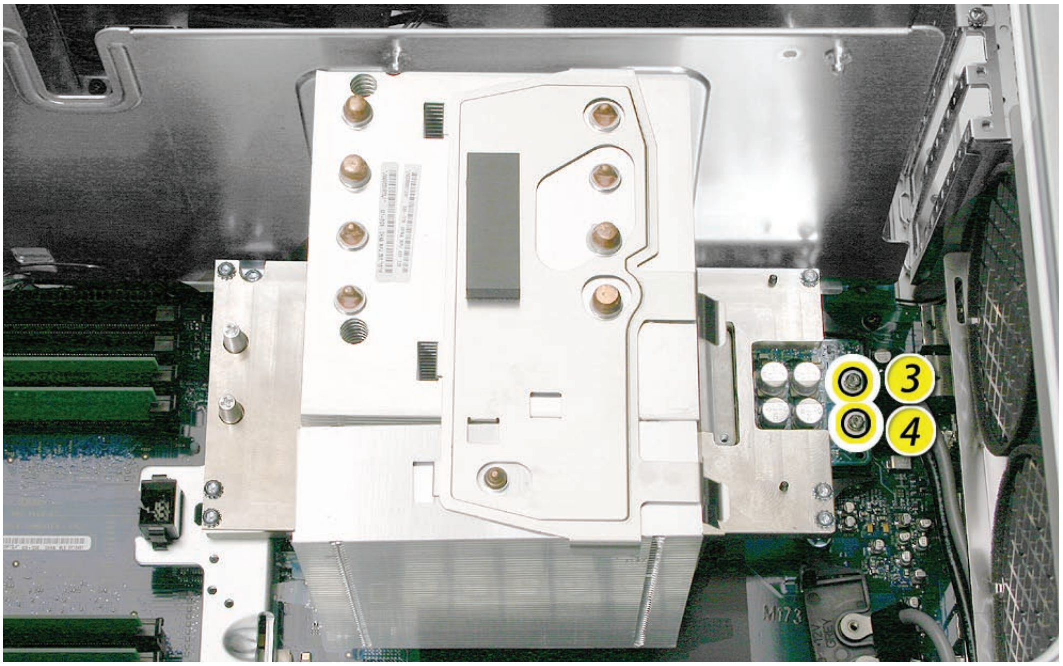


Note: For steps 3–6, remove or loosen the screws in the order indicated in the illustrations.

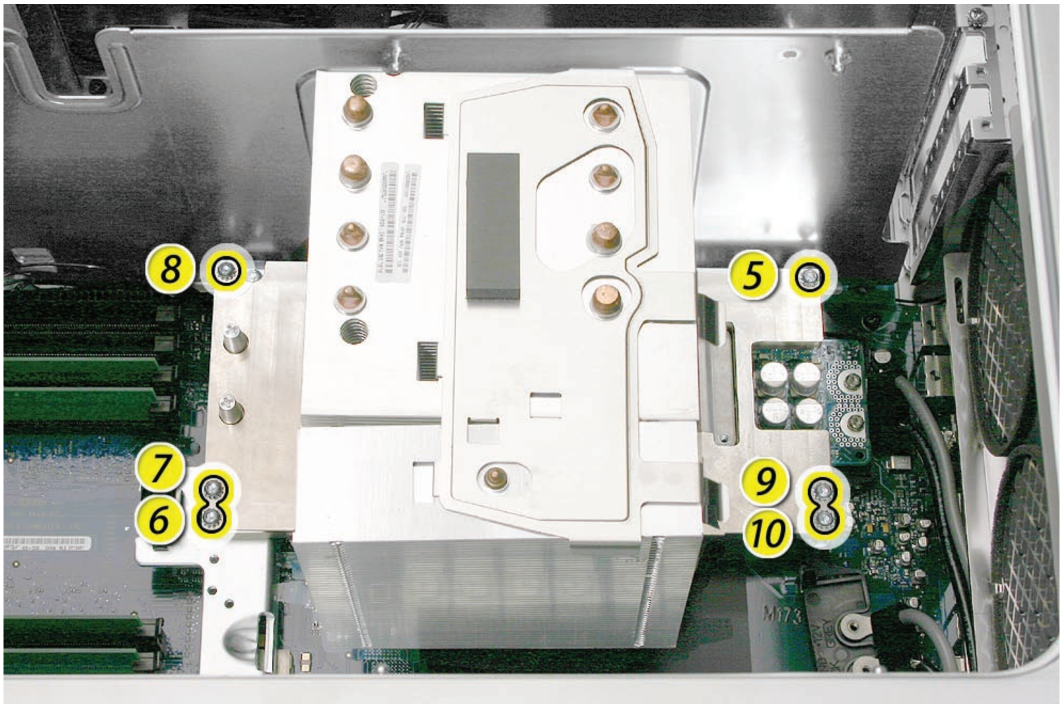
3. Insert a long-handled 4 mm ballhead hex driver into the two holes on the top of the heatsink and tighten the two captive screws.



4. Using a long-handled 3 mm flathead hex driver, replace the two short screws that mount the power supply terminal.



5. Using a long-handled 3 mm flathead hex driver, replace the six long processor mounting screws.



6. Replace the processor inlet frame on the front of the heatsink.
7. Replace the heatsink cover.
8. Replace the rear exhaust fan assembly.
9. Replace all graphics and PCI Express cards.
10. Replace the front inlet fan assembly.

Important: Whenever you replace a processor with a new processor, you must run Apple Service Diagnostic (once the computer is reassembled). Apple Service Diagnostic for Power Mac G5 (Late 2005) is available as a download from the Disc Images section of the Apple Service Source website. For more information, see "Thermal Calibration" in the Troubleshooting chapter.

Processor Inlet Frame (Quad)

Tools

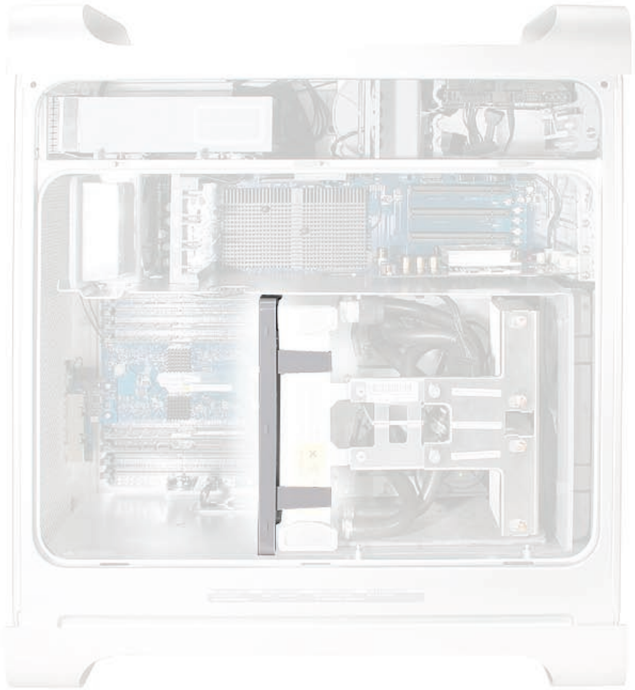
No tools are required for this procedure.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

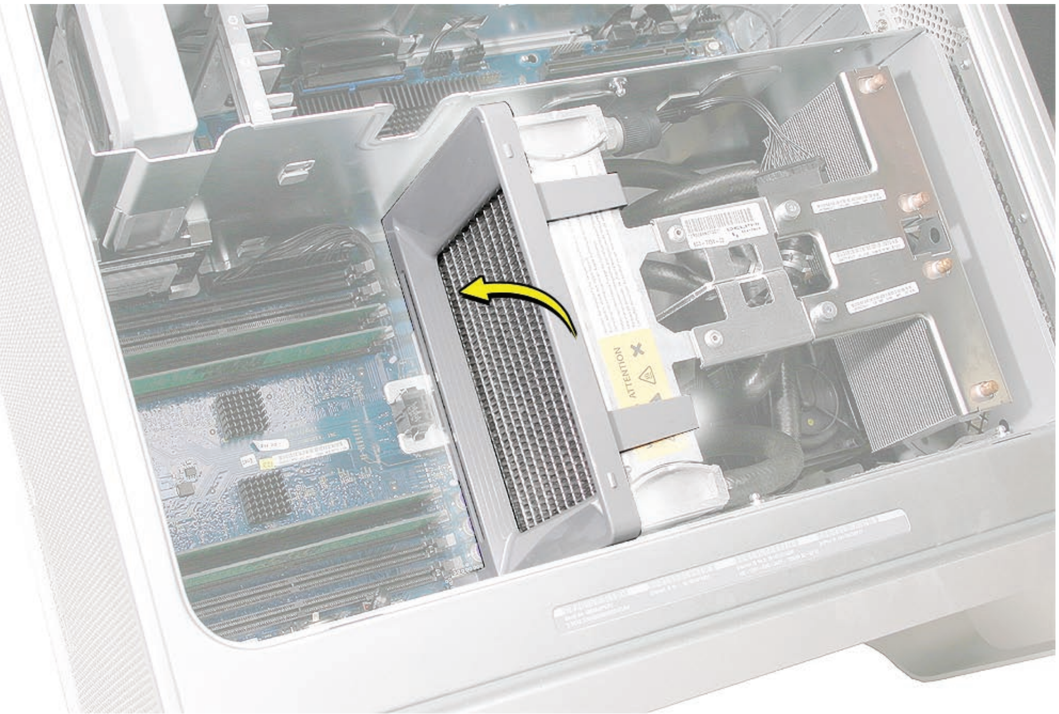
- Front inlet fan assembly
- Heatsink cover

Part Location



Procedure

1. Lift the processor inlet frame off the processor.
2. Remove the frame from the enclosure.



Processor (Quad)

Tools

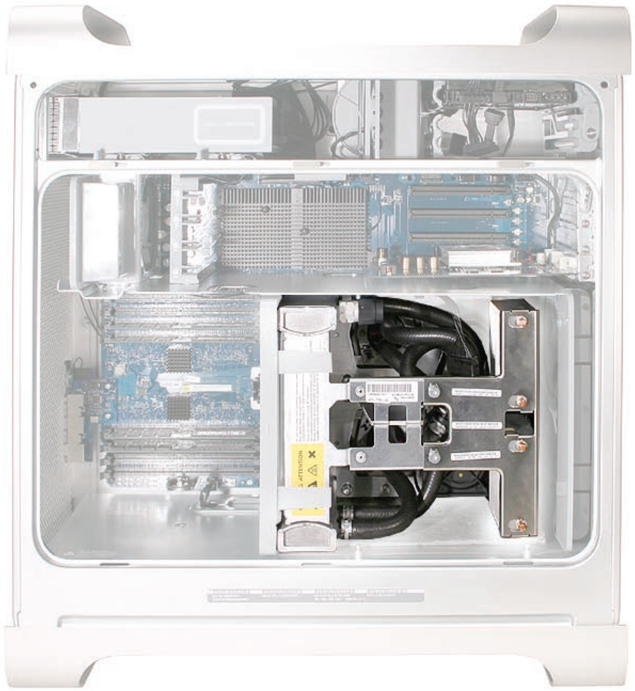
The only tools required for this procedure are a long-handled 3 mm flathead hex driver and a long-handled 4 mm ballhead hex driver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

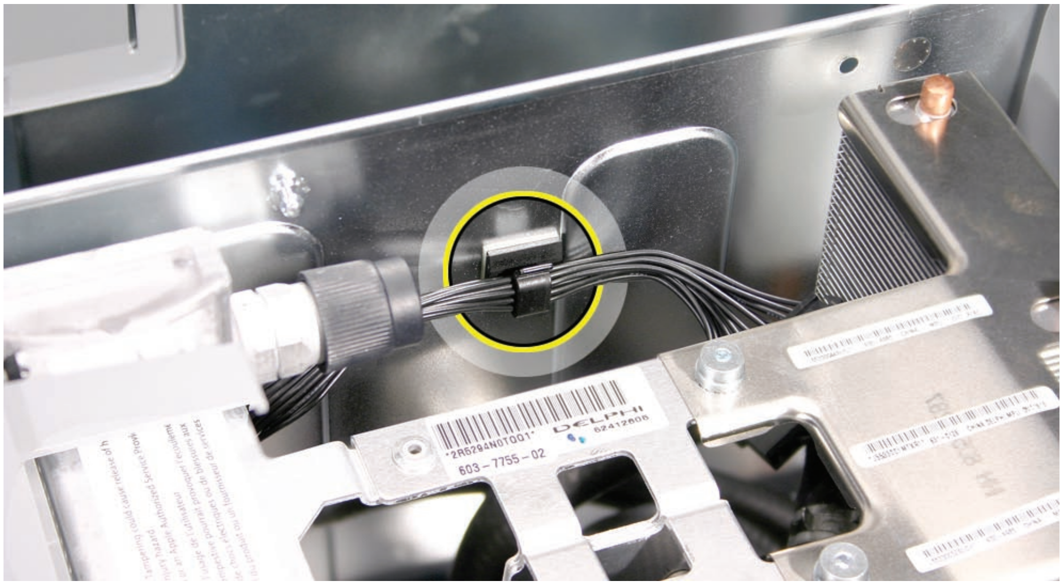
- Front inlet fan assembly
- Heatsink cover
- Processor inlet frame (Quad)

Part Location

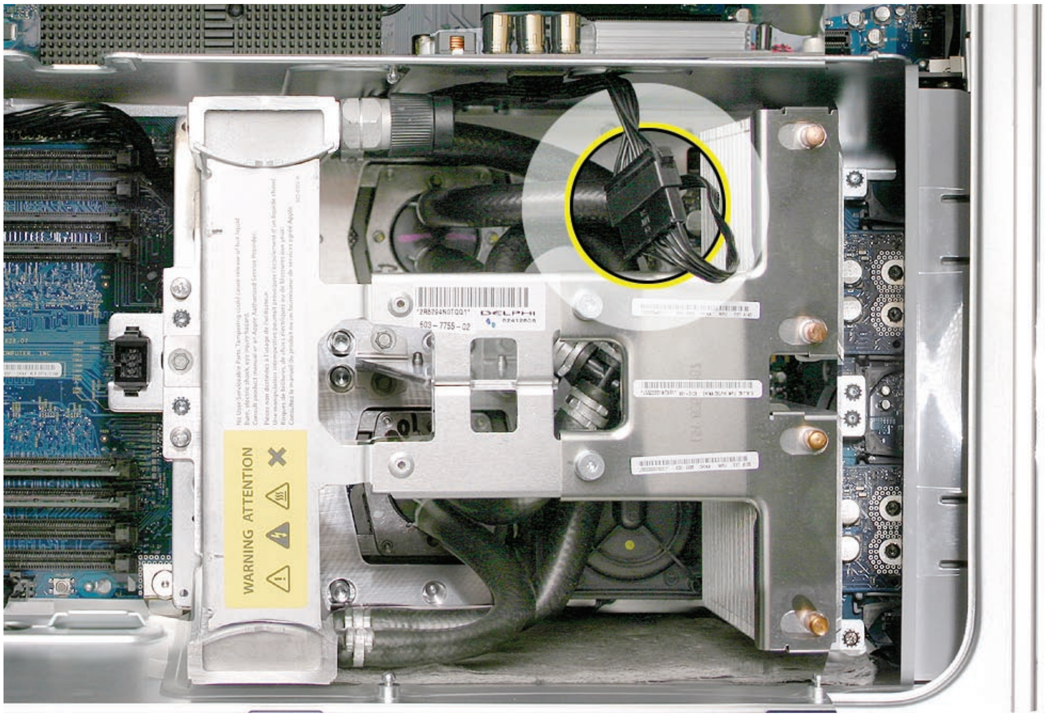


Procedure

1. Remove the processor support bar cable from the clip on the PCI divider.

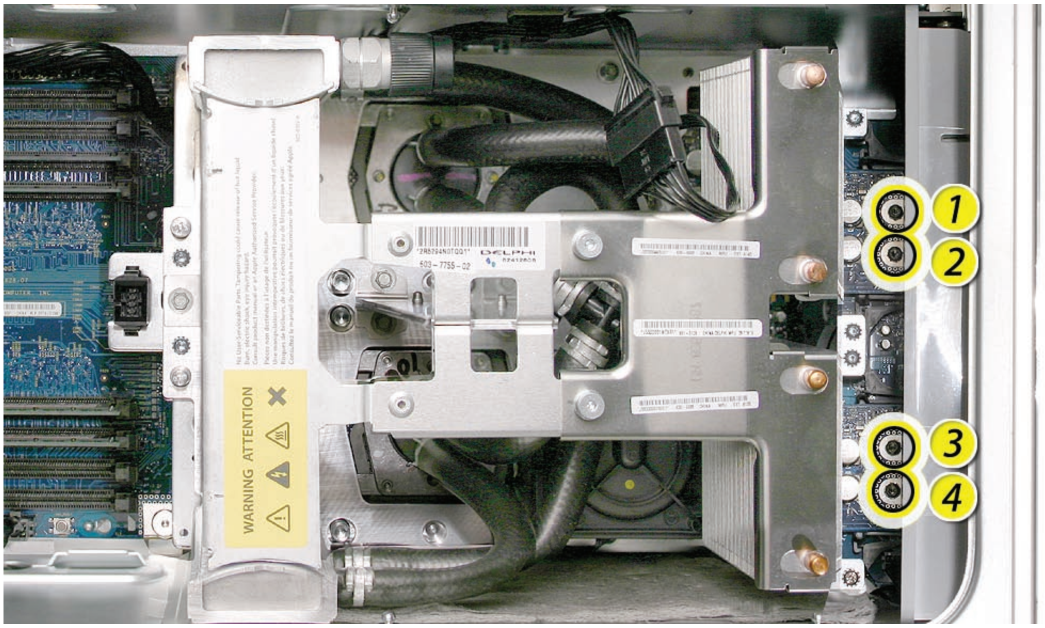


2. Disconnect the processor support bar cable from the processor cable.



Note: For steps 3–6, remove or loosen the screws in the order indicated in the illustrations.

3. Using a 3 mm flathead hex driver, remove the four short screws that mount the two processor terminal assemblies.



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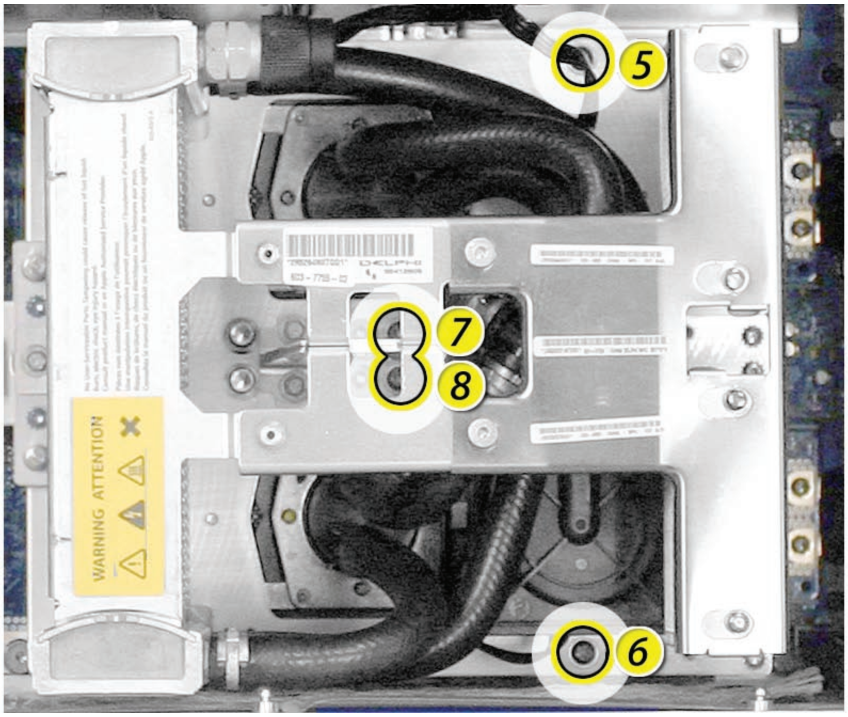
WARNING ATTENTION

4. Using a 3 mm flathead hex driver, loosen the four captive float plate screws. (Do not remove the captive screws from their standoffs.)



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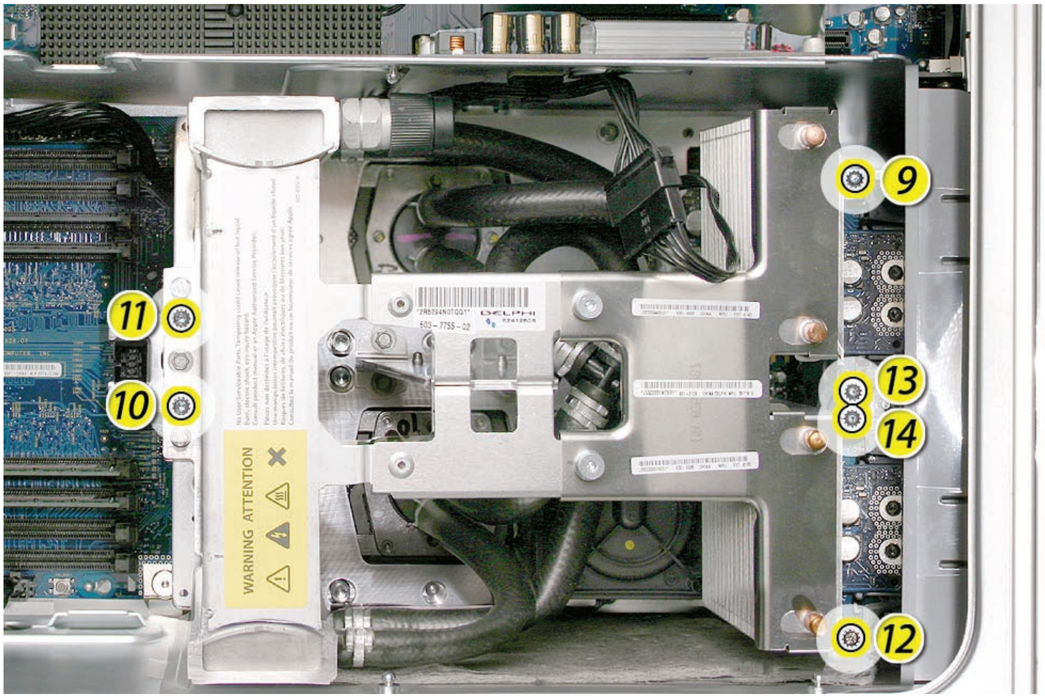
WARNING ATTENTION

5. Using a 3 mm flathead hex driver, remove the six long processor mounting screws.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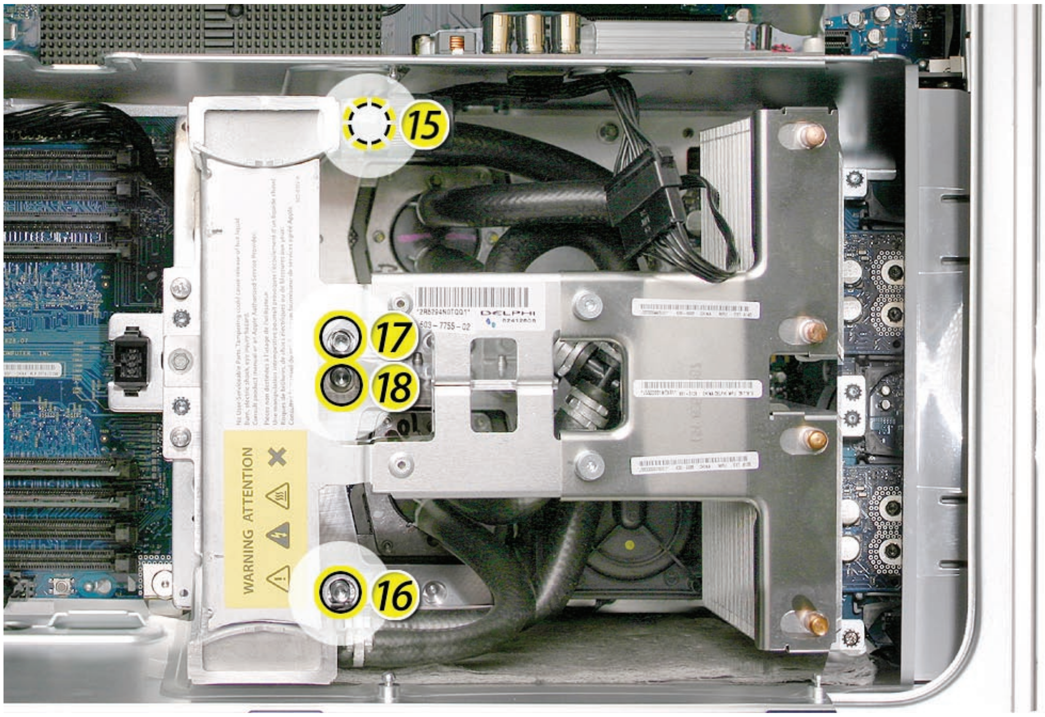
WARNING ATTENTION

6. Using a 4 mm ballhead hex driver, loosen the four captive screws near the middle of the processor.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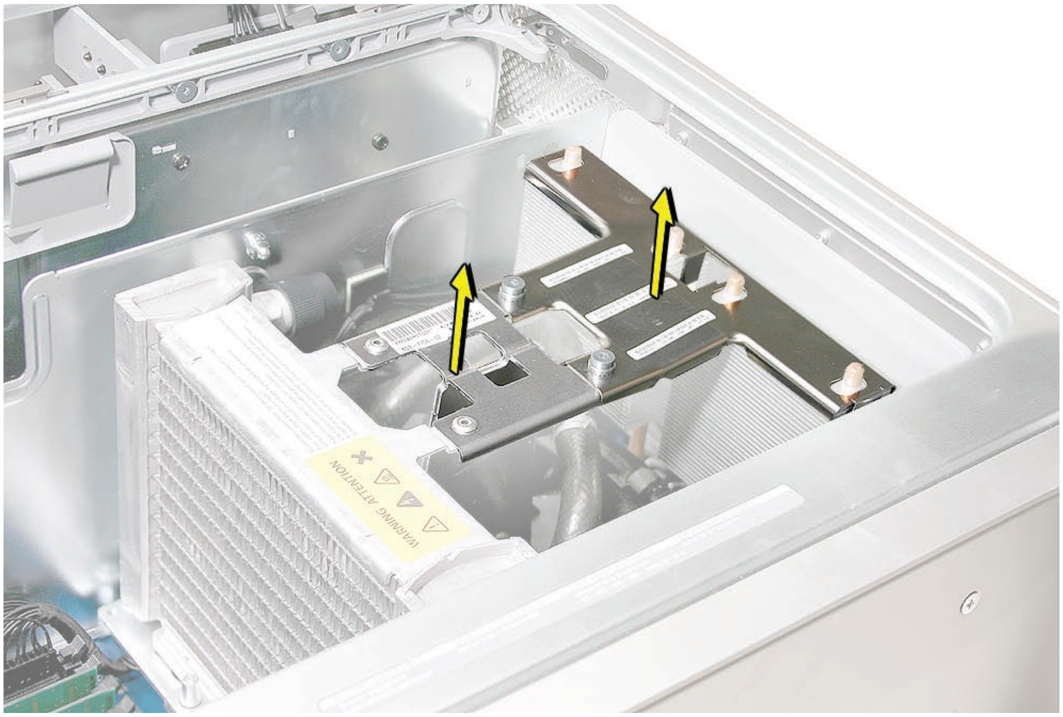
WARNING ATTENTION

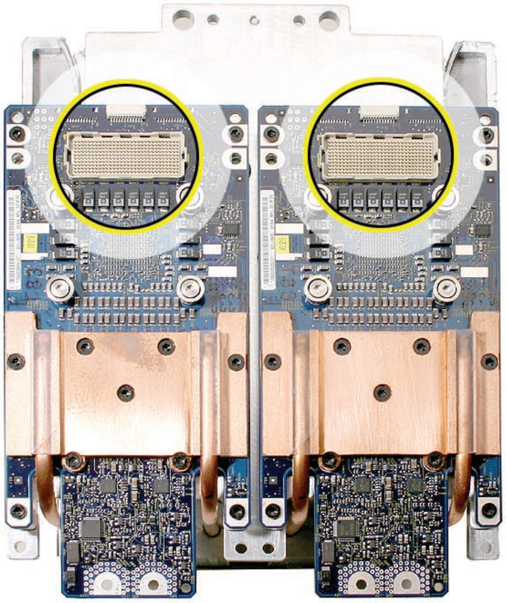
7. Hold the heatsink by the middle and lift the processor/heatsink straight up out of the computer.



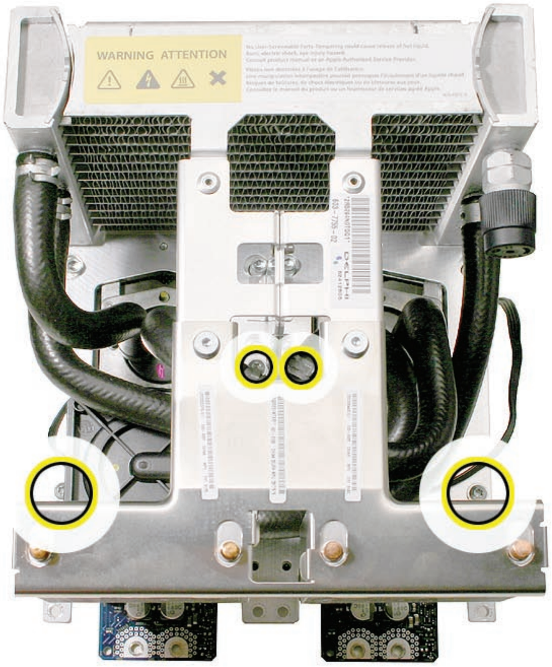
Warning: The heatsink and processor are one unit. Do not attempt to separate the heatsink from the processor.

Replacement Procedure

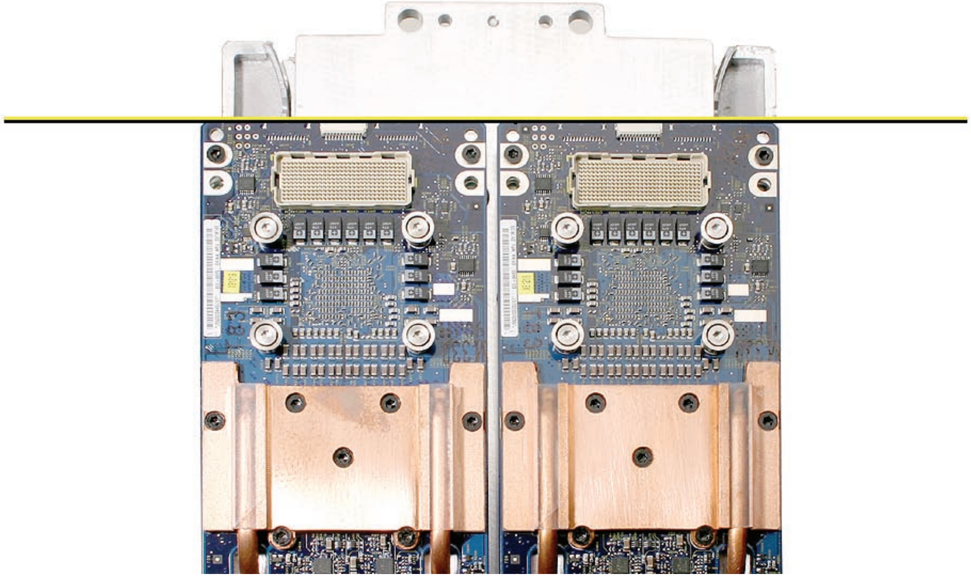
1. If you are replacing the processor with a new processor, do the following:
   - When removing the new processor from its packaging, be careful to lift the processor straight up out of the box. Tilting the processor could damage the heatsink seal.
   - Before installing the processor, remove the caps over the processor connectors.



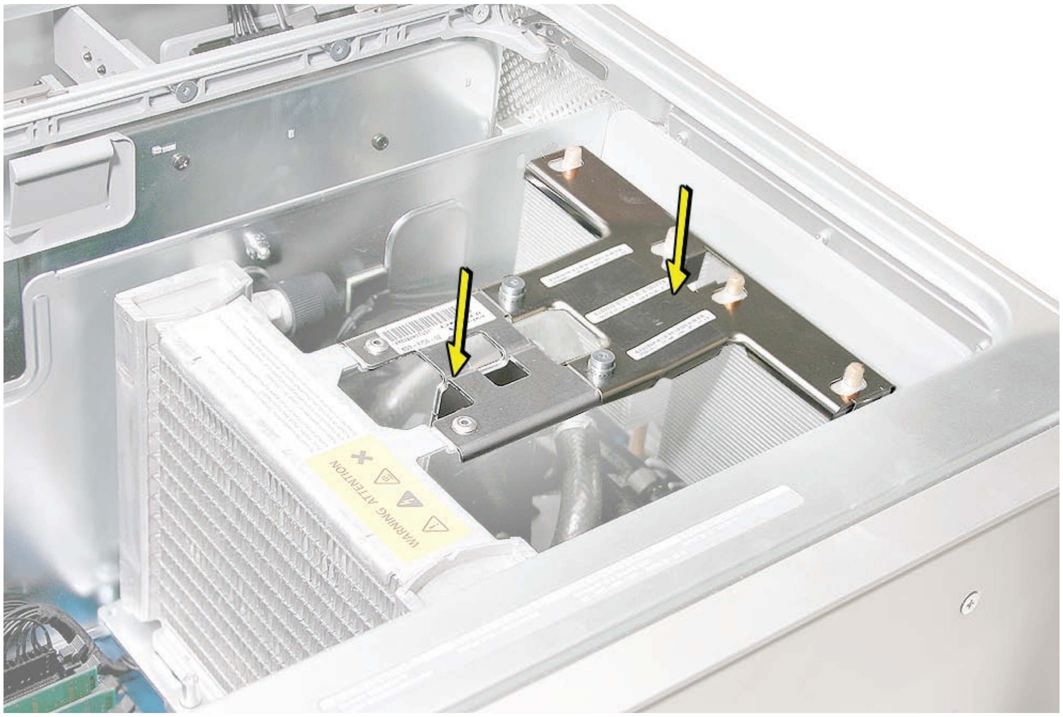
   - Loosen the screws marked below.



- Check to make sure the top edges of both processors align.

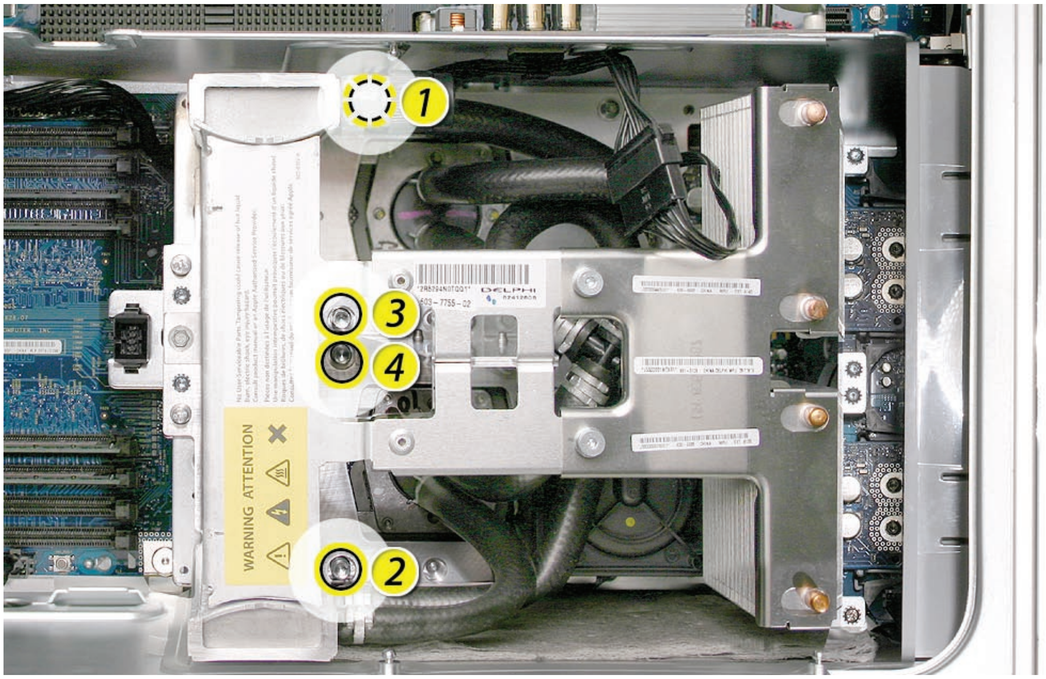


2. Lower the processor over the processor standoffs.
3. Press down on the middle (bridge) of the heatsink to make sure the processor is connected to the logic board. Gently rock the heatsink until it feels seated.
   Warning: Don't press on the end of the heatsink or you'll damage the processor.



Note: For steps 4–7, replace or tighten the screws in the order indicated in the illustrations..

4. Using a 4 mm ballhead hex driver, tighten the four captive screws near the middle of the processor.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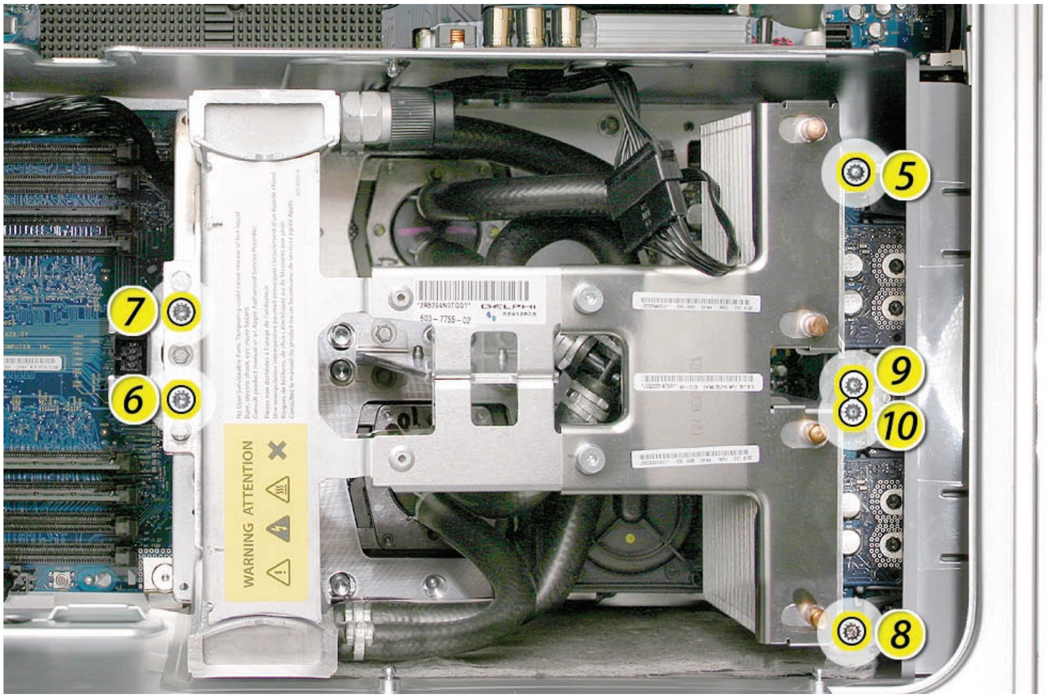
WARNING ATTENTION

5. Using a 3 mm flathead hex driver, replace the six long processor mounting screws.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10
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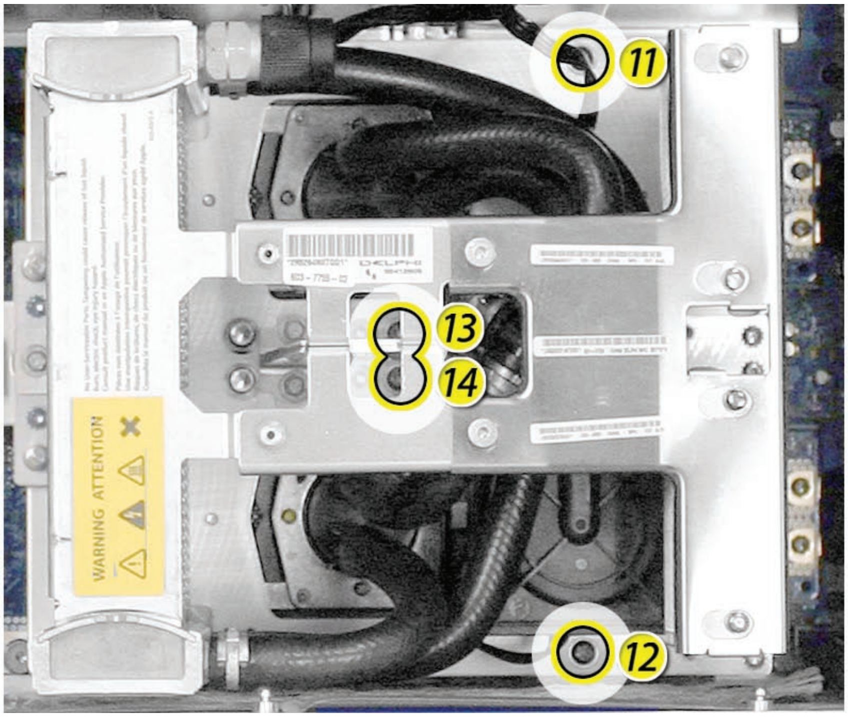
WARNING ATTENTION

6. Using a 3 mm flathead hex driver, tighten the four captive float plate screws.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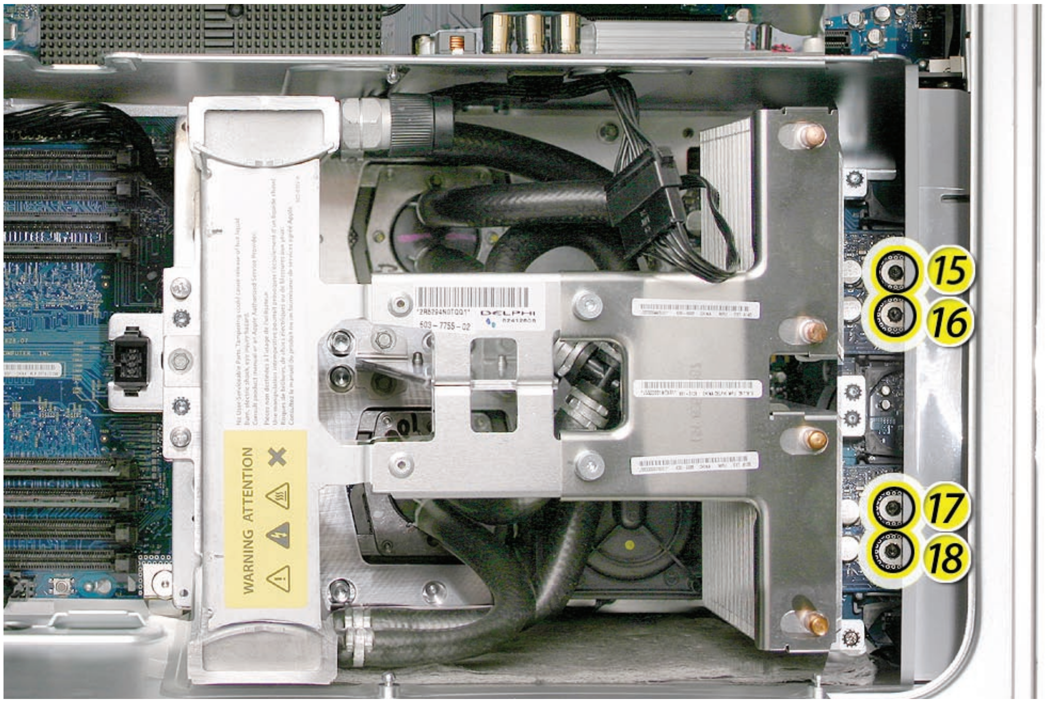
WARNING ATTENTION

7. Using a 3 mm flathead hex driver, replace the four short screws that mount the two processor terminal assemblies.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WARNING ATTENTION

8. Reconnect the processor support bar cable with the processor cable.
9. Replace the processor support bar cable in the clip on the PCI divider.
10. Replace the processor inlet frame assembly on the front of the heatsink.
    Important: If you are replacing the processor with a new processor, be sure to use the inlet frame included with the replacement processor.
11. Replace the heatsink cover.
12. Replace the front inlet fan assembly.

Important: Whenever you replace a processor with a new processor, you must run Apple Service Diagnostic (once the computer is reassembled). Apple Service Diagnostic for Power Mac G5 (Late 2005) is available as a download from the Disc Images section of the Apple Service Source website. For more information, see "Thermal Calibration" in the Troubleshooting chapter.

Processor Support Bar and Cable

Note: The illustrations in this procedure are based on the Power Mac G5 (Late 2005 Quad) computer. Although the Power Mac G5 (Late 2005 Dual) support bar cable differs from the Quad cable (it has two connectors rather than three), the take-apart procedure for all configurations is primarily the same.

Tools

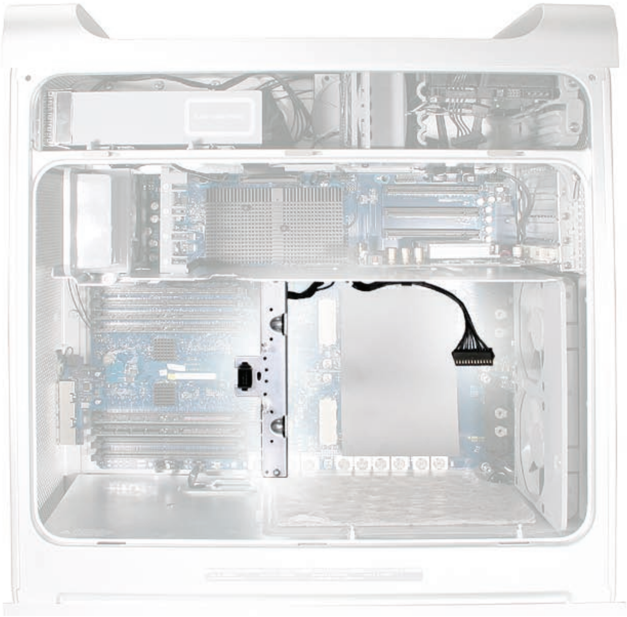
The only tool required for this procedure is a Phillips #1 screwdriver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

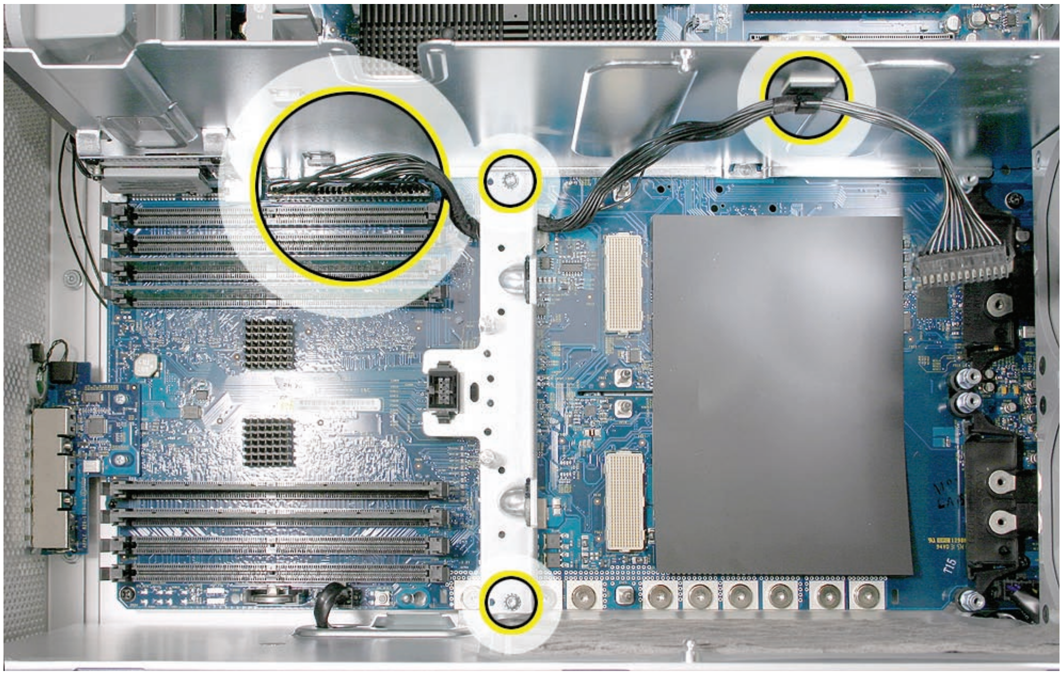
- Front inlet fan assembly
- Heatsink cover
- Processor inlet frame (Dual 2.0/2.3 GHz) or Processor inlet frame (Quad)
- Processor (Dual 2.0/2.3 GHz) or Processor (Quad)

Part Location



Procedure

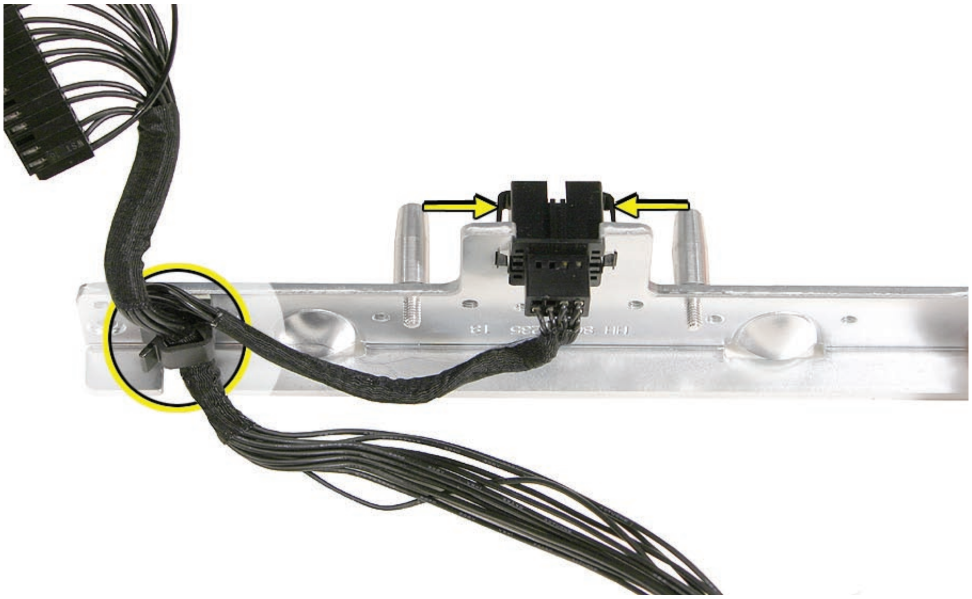
1. Remove the two mounting screws from the processor support bar.
2. Disconnect the processor support bar cable from the logic board.
3. Power Mac G5 (Late 2005 Quad): If necessary, remove the processor support bar cable from the clip on the PCI divider.



4. Lift the bar and attached cable straight up and out of the enclosure.

To remove the cable from the support bar:

1. Depress the two clips on either side of the front inlet fan connector and remove the connector from the support bar.
2. Unclip the cable from the support bar and remove the cable from the bar.



Front Panel Board

Tools

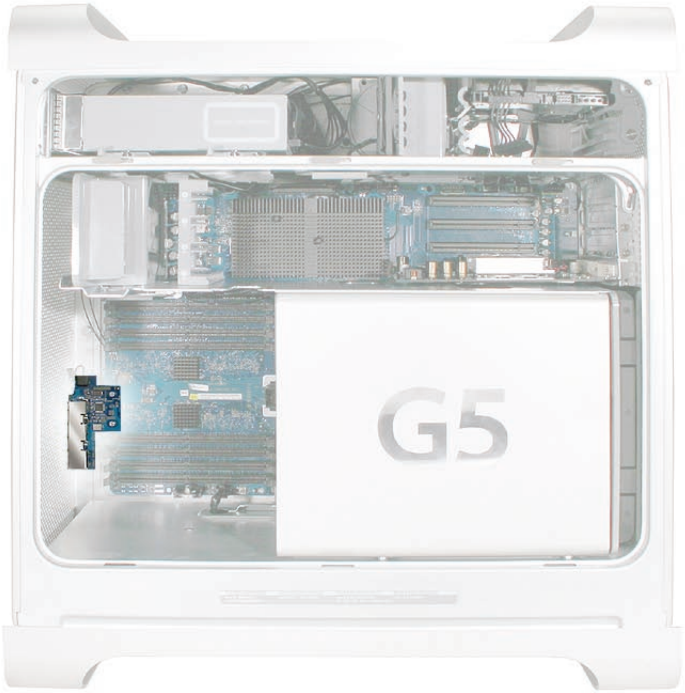
The only tool required for this procedure is a Phillips #1 screwdriver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

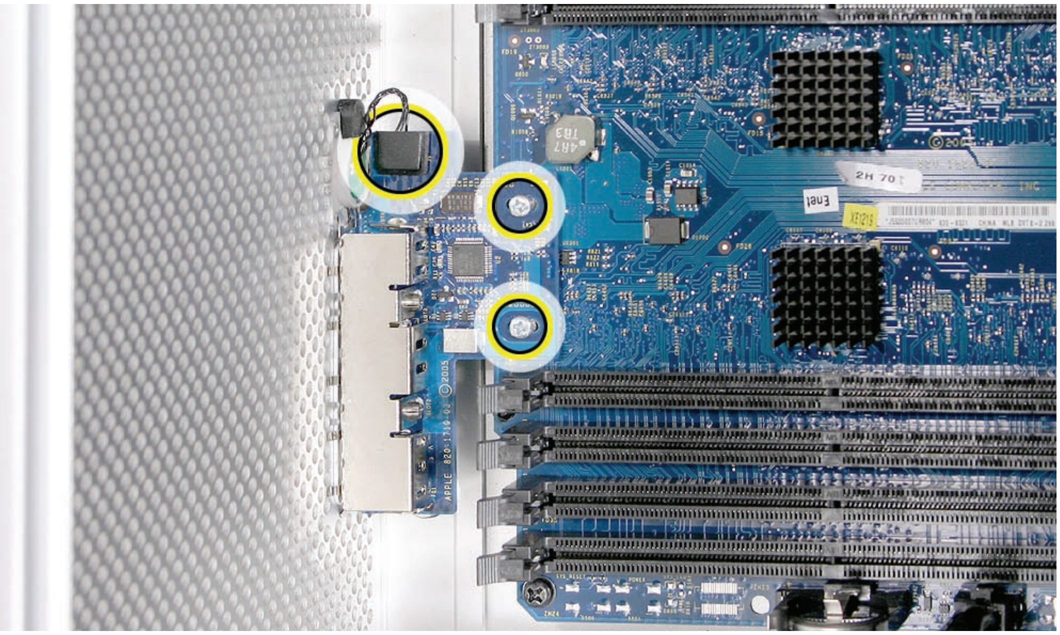
- Front inlet fan assembly
- Any memory DIMMs installed next to the front panel board

Part Location

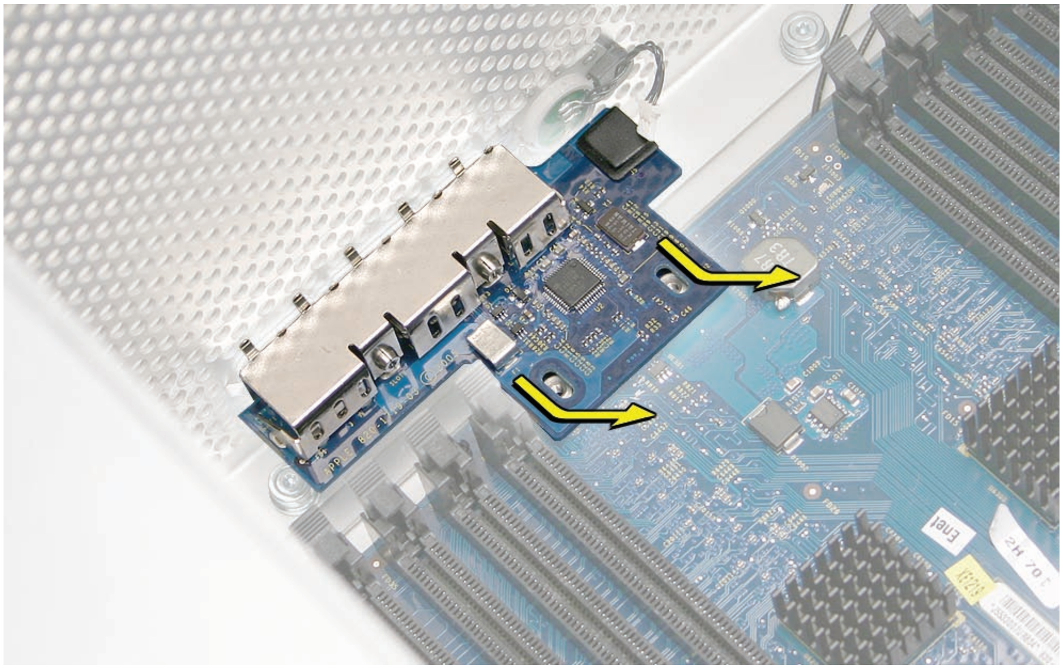


Procedure

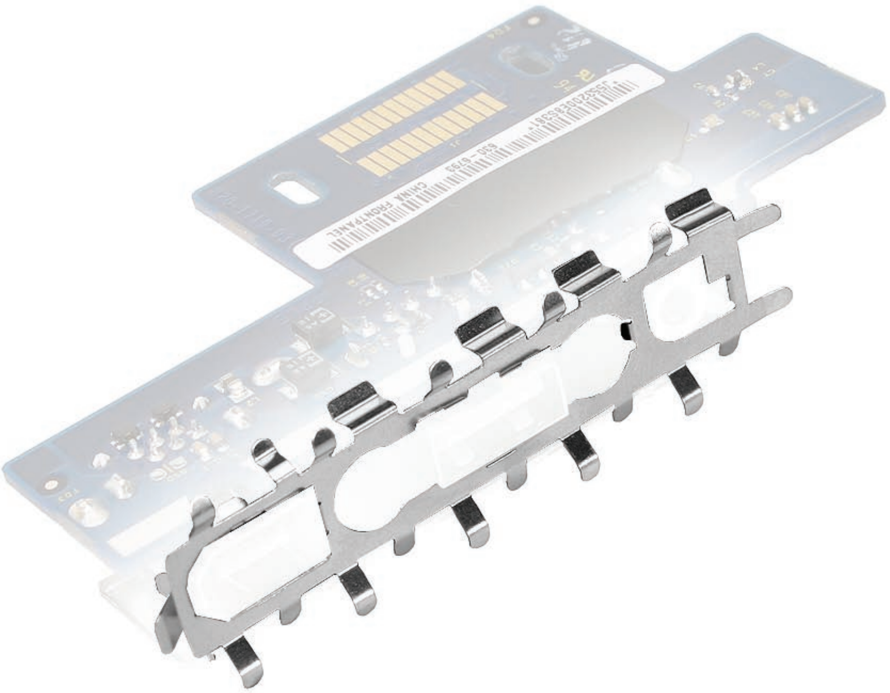
1. Disconnect the power button cable from the front panel board.
2. Remove the two front panel board mounting screws.



3. Gently pull the board back from the front panel, tip the back of the board up so that it clears the DIMM slot ejectors, and remove the board from the enclosure.



Note: If you are replacing the front panel board with a new board, carefully remove the EMI shield from the original board and transfer it to the replacement board. Make sure that the fingers of the shield enclose the board as shown in the illustration below.



Replacement Note: When replacing the front panel board, align the ports on the board with the openings in the front panel board. Then press the board firmly to the enclosure.

Power Button

Tools

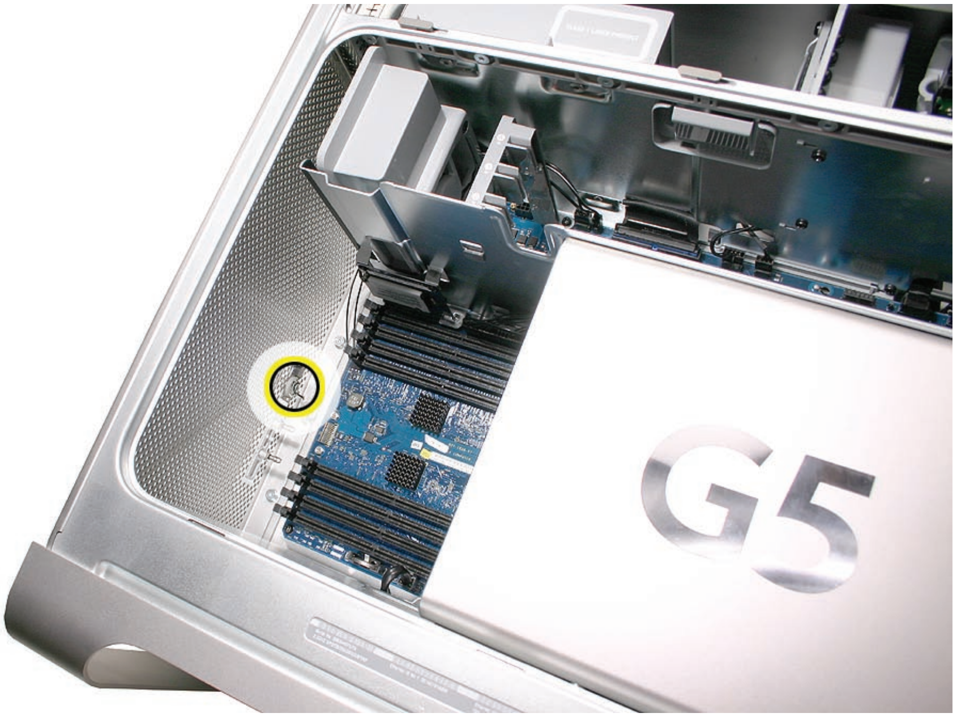
The only tool required for this procedure is a jeweler's flat-blade screwdriver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

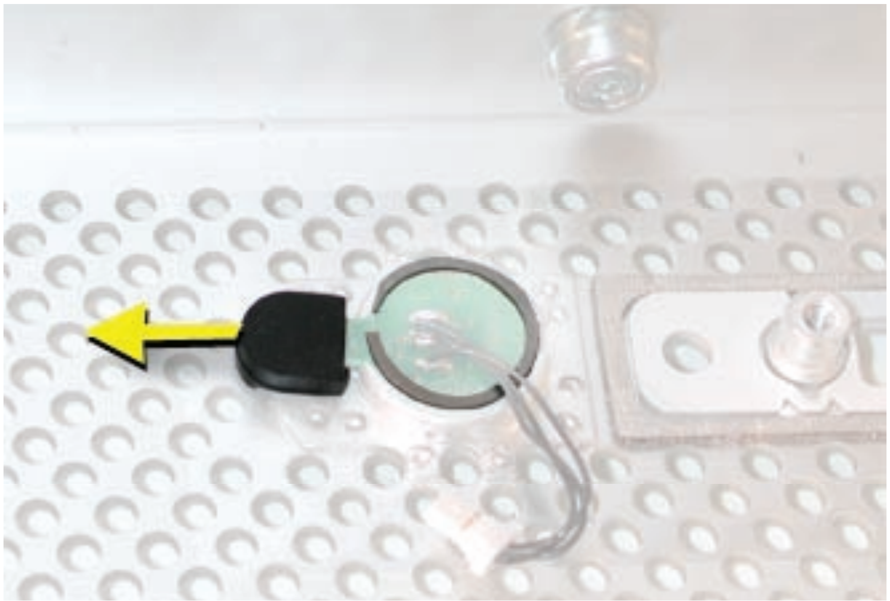
- Front inlet fan assembly
- Any memory DIMMs installed next to the front panel board
- Front panel board

Part Location

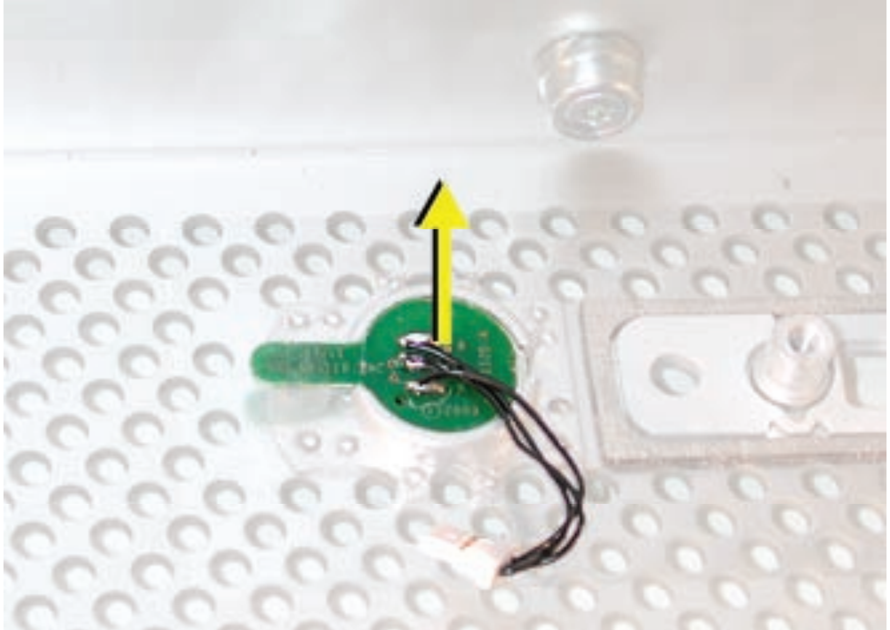


Procedure

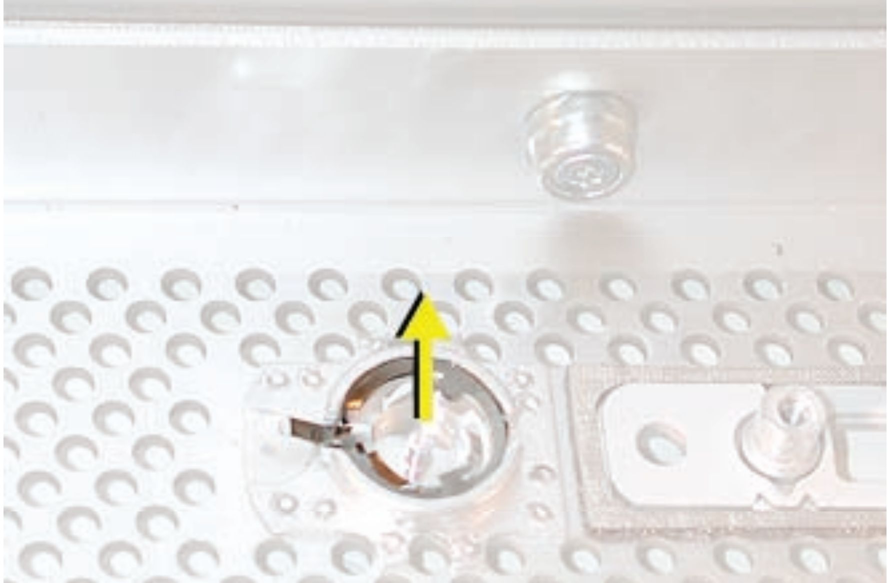
1. Lay the computer so that the front panel is facing down.
2. Remove the black rubber cap that covers the power button LED.
3. Using a jeweler's flat-blade screwdriver, pry up the metal C-ring that secures the power button board.



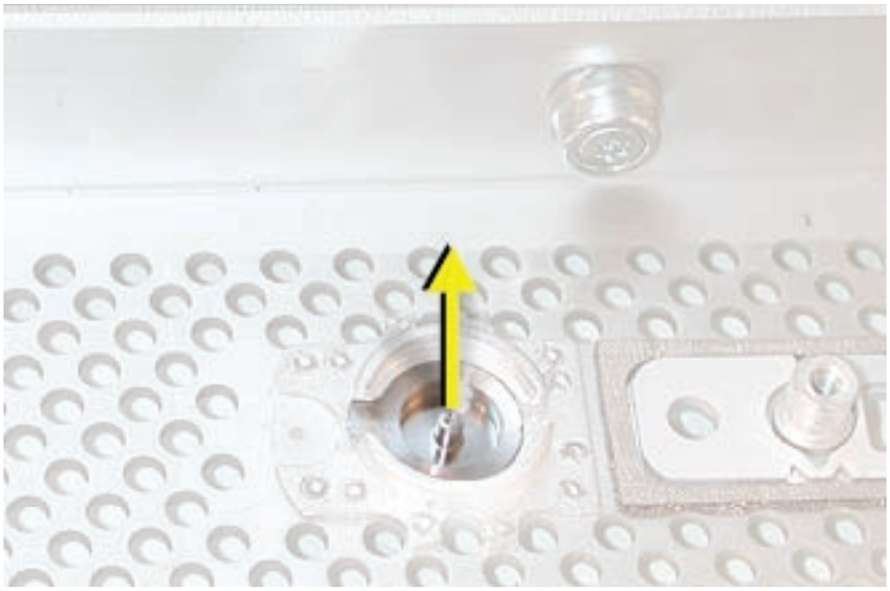
4. Lift up and remove the power button board.



5. Remove the metal activation ring that lies below the power button board.



6. Remove the power button from the enclosure.



Logic Board

Tools

The following tools are required for this procedure:

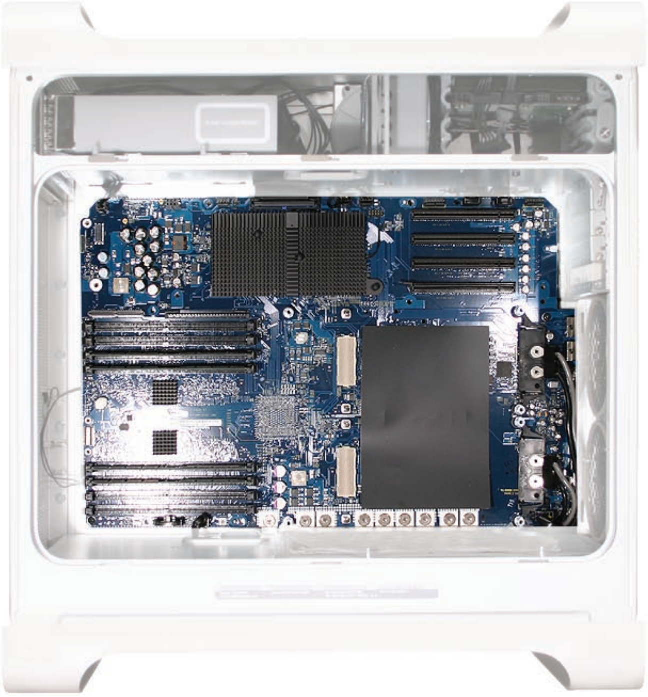
- Phillips #1 screwdriver
- long-handled T-10 torx driver
- 9/32-inch nut driver

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

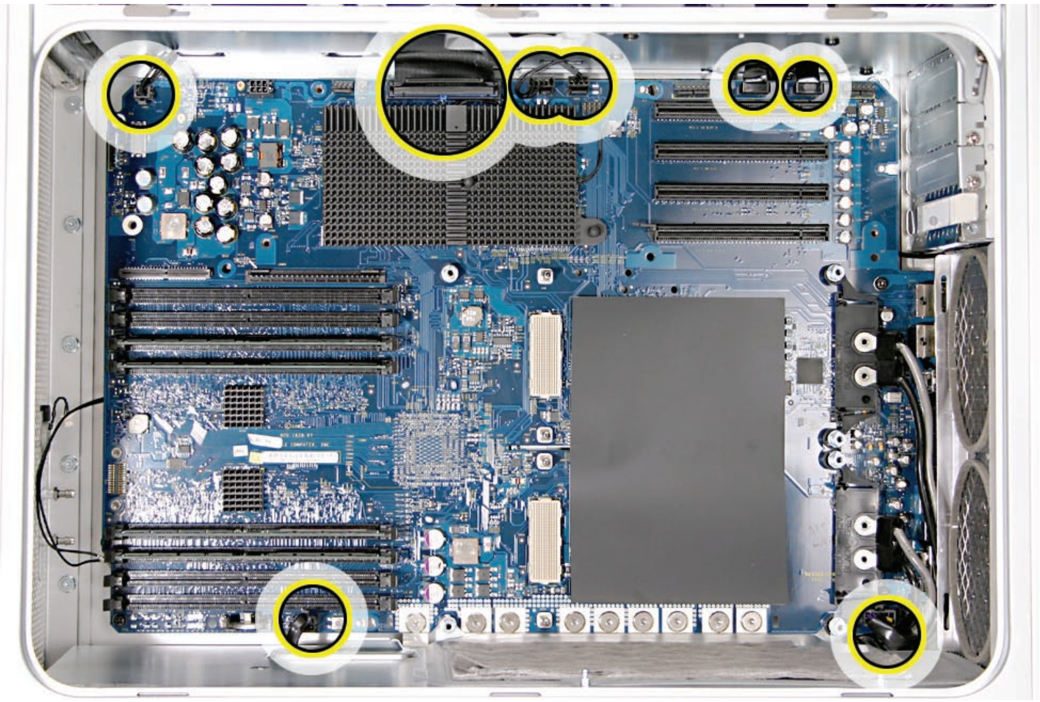
- Front inlet fan assembly
- Heatsink cover
- Processor inlet frame (Dual 2.0/2.3 GHz) or Processor inlet frame (Quad)
- Processor (Dual 2.0/2.3 GHz) or Processor (Quad)
- Processor support bar
- All graphics and PCI Express cards
- AirPort Express/Bluetooth combo card and runway card
- Rear exhaust fan assembly
- PCI card guide
- Speaker/fan assembly
- Front panel board
- PCI divider

Part Location

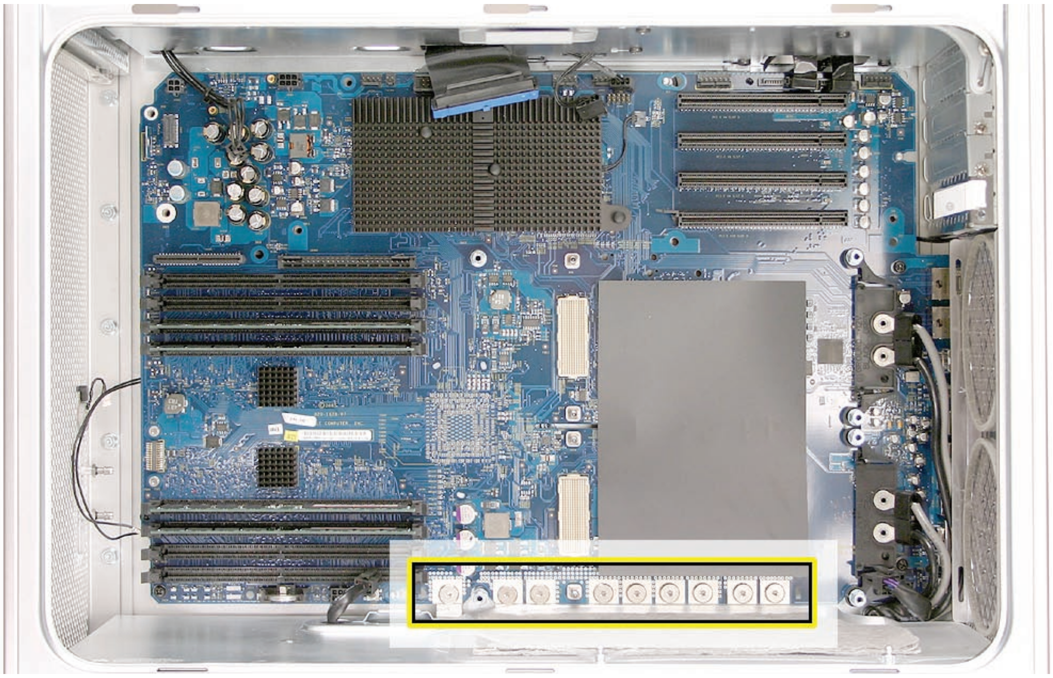


Procedure

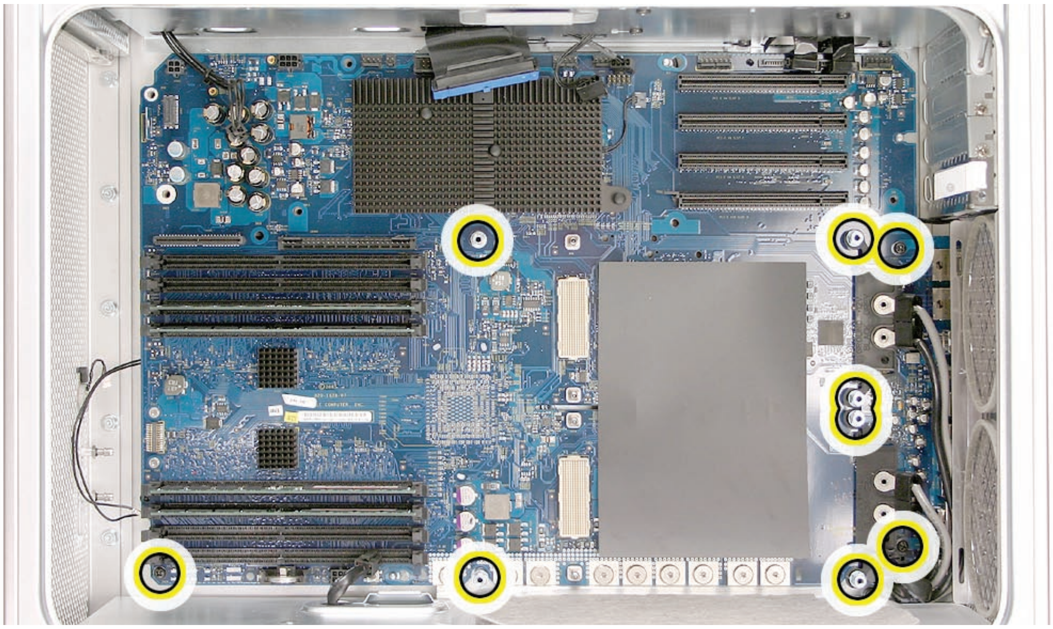
1. Disconnect the cables from the top and bottom edge of the logic board.



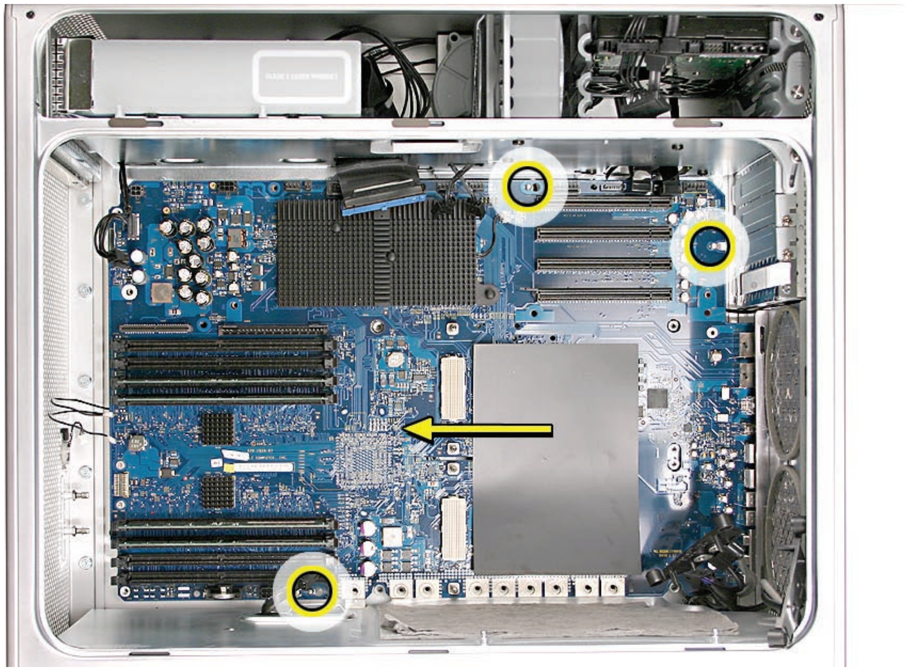
2. Using a long-handled T-10 torx driver, remove the nine power supply bus bar screws.



3. Using a 9/32-inch nut driver, remove the six logic board standoffs.
4. Using a Phillips #1 screwdriver, remove the three black logic board mounting screws.

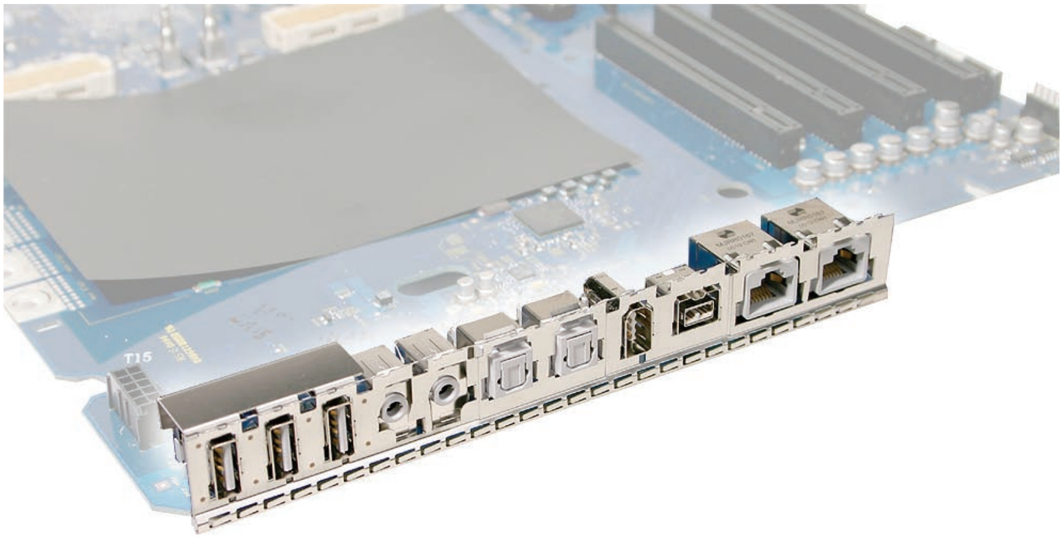


5. Move the cables and processor power terminal assemblies out of the way. Then carefully slide the logic board to the left to release it from the three mushroom-head standoffs.
6. Tilt the logic board up and maneuver it out of the enclosure, making sure the ports clear the enclosure openings.



Note: Perform the following procedures only if you are replacing the logic board with a new logic board.

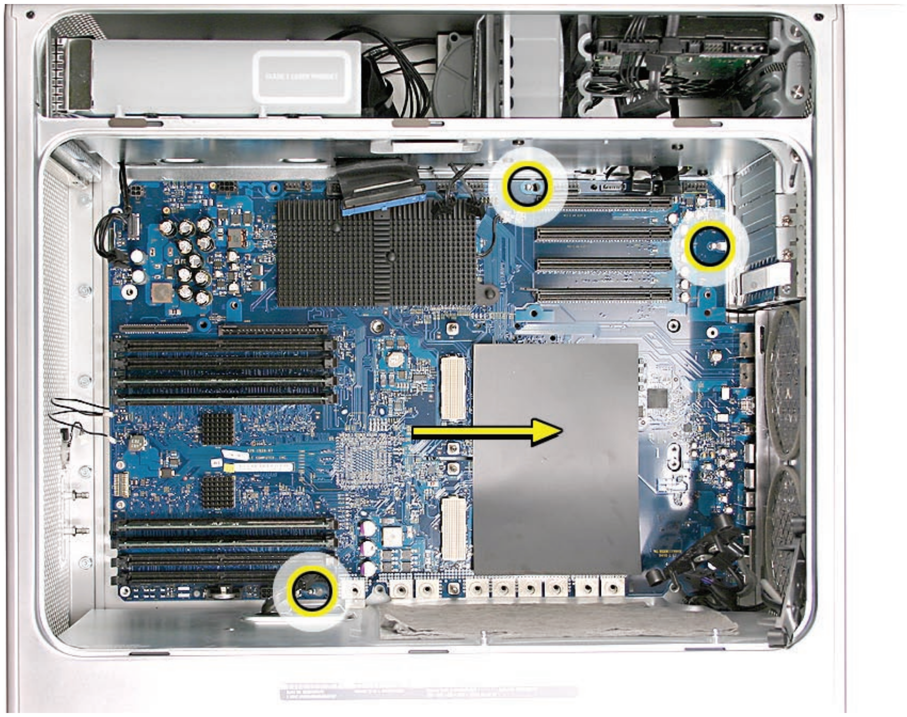
7. Transfer the following from the original logic board to the replacement board:
   - Memory DIMMs
   - Ambient board
   - Quadro FX 4500 graphics card cable (if installed)
8. Transfer the port EMI shield from the original logic board to the replacement logic board, making sure the shield is fully seated on the ports.



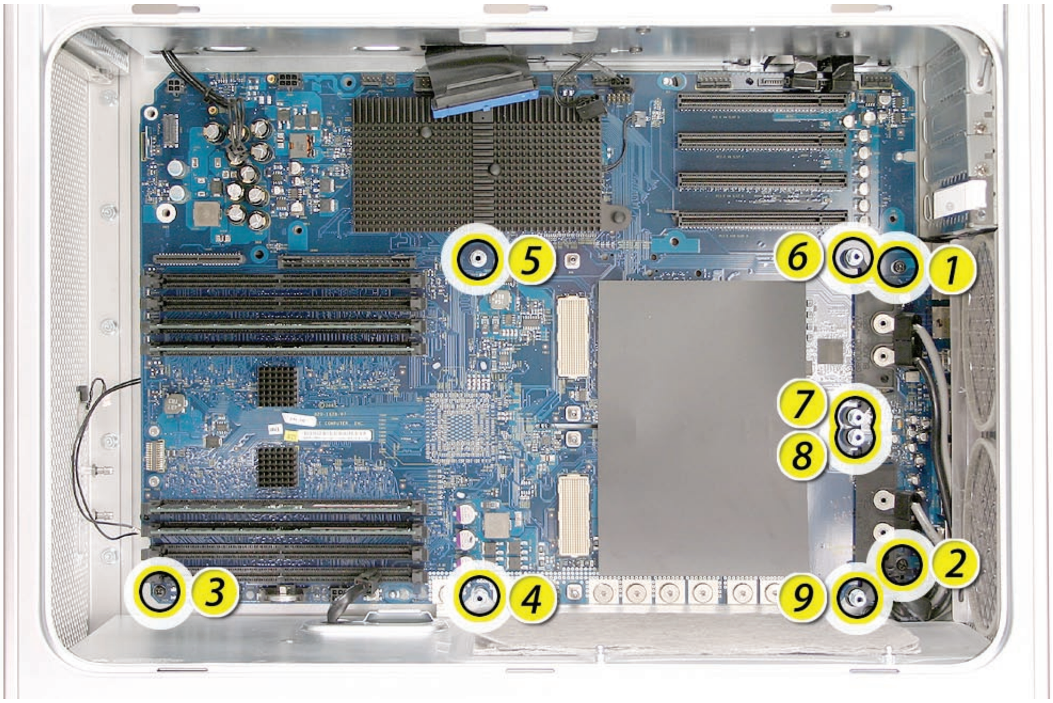
Replacement Procedure

Important: Replacement logic boards may have a mylar sheet or Kapton tape installed in the area of the processor connectors. Do not remove the mylar or tape.

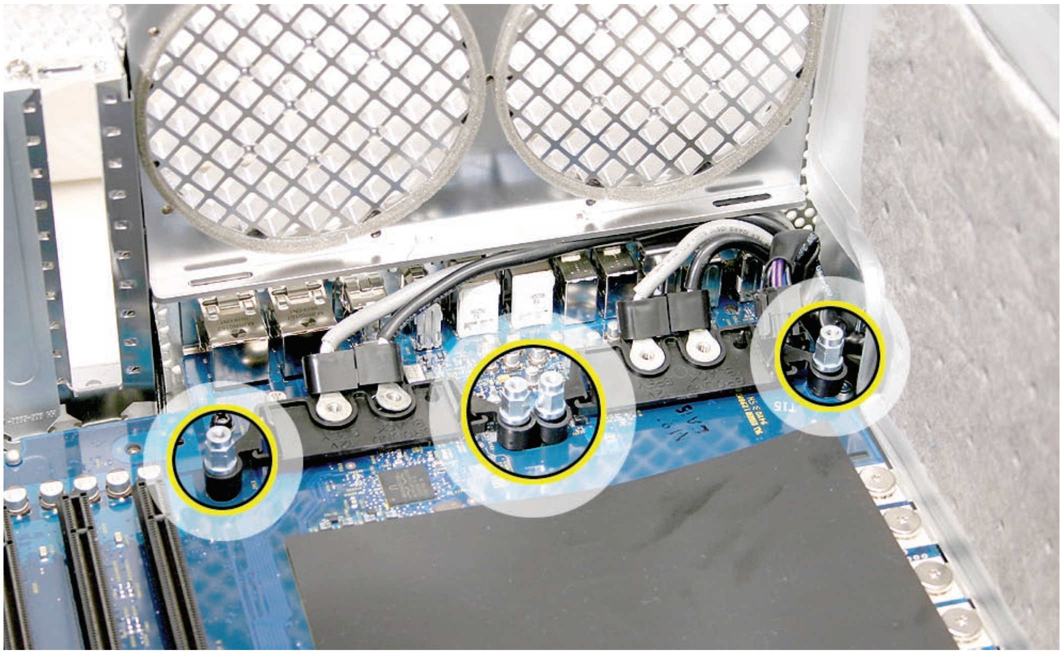
1. Temporarily tuck the top cables into the openings in the media shelf so that they are out of the way. Also tape or hold the bottom cables out of the way.
   Note: You may find a long strip of packing tape useful in securing the cables.
2. Angle the logic board into the enclosure so that the port edge goes in first.
   Warning: Be careful not to catch the battery on the edge of the case as you lower the logic board into the enclosure. Also make sure the connector ends of the antenna cables are not caught under the board.
3. Position the logic board on the three mushroom-head standoffs, aligning the ports with the openings in the enclosure.
4. Slide the board toward the rear of the computer so that the logic board locks onto the mushroom-head standoffs and the ports are fully seated in the back panel openings.



5. Replace the three logic board screws and six standoffs in the order indicated below.



Important: Make sure the four rear standoffs (numbers 6–9 in the illustration above) are threaded through the rings on the processor power terminal assemblies before you insert the standoffs into the logic board.



6. Replace the nine power supply bus bar screws.
7. Reconnect all cables at the top and bottom edge of the logic board.
8. Replace the PCI divider.
9. Replace the front panel board.
10. Replace the speaker/fan assembly and reconnect its cables to the logic board.
11. Replace the PCI card guide.
    Note: If the computer includes a Quadro FX 4500 graphics card, you must connect the Quadro FX 4500 cable to the logic board before you replace the PCI card guide.
12. Replace the rear exhaust fan assembly and reconnect its cable to the logic board.
13. Replace the runway and AirPort Express/Bluetooth combo cards.
14. Replace all graphics and PCI Express cards.
15. Replace the processor support bar and reconnect the processor support bar cable to the logic board.
16. Replace the processor.
17. Replace the processor inlet frame.
18. Replace the heatsink cover.
19. Replace the front inlet fan assembly.

Important: Whenever you replace a logic board with a new logic board, you must run Apple Service Diagnostic (once the computer is reassembled). Apple Service Diagnostic for Power Mac G5 is available as a download from the Disc Images section of the Apple Service Source website. For more information, see "Thermal Calibration" in the Troubleshooting chapter.

Antenna Board and Cables

Note: The antenna cables are permanently attached to the antenna board. The cables and board are removed from the enclosure as a unit.

Tools

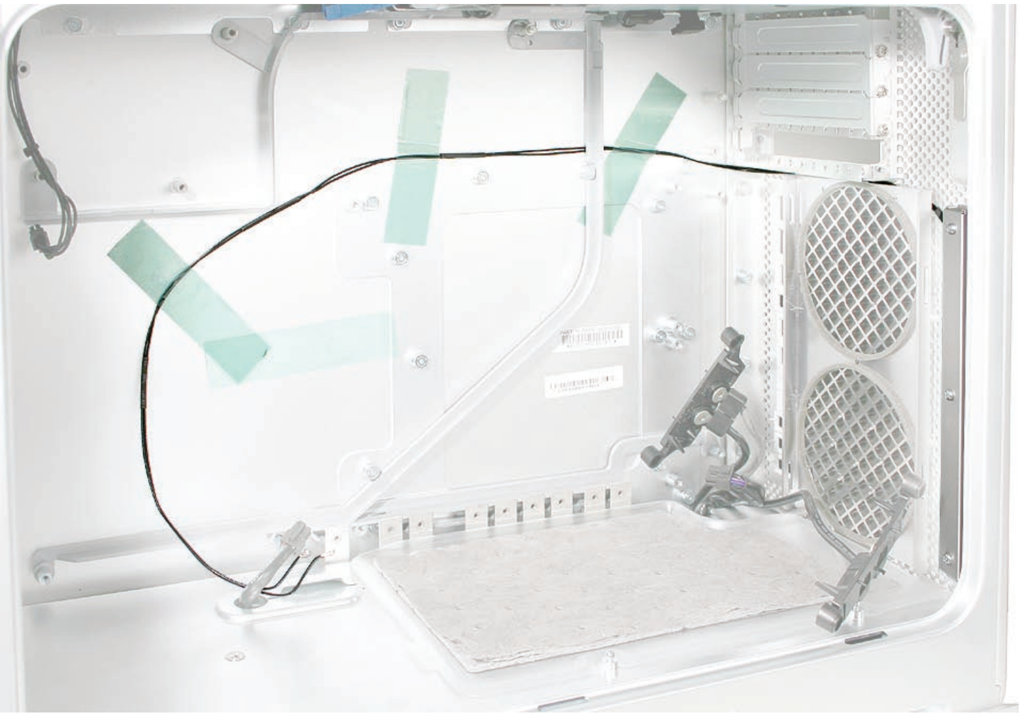
The only tools required for this procedure are a Phillips #1 screwdriver and a flatblade screwdriver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

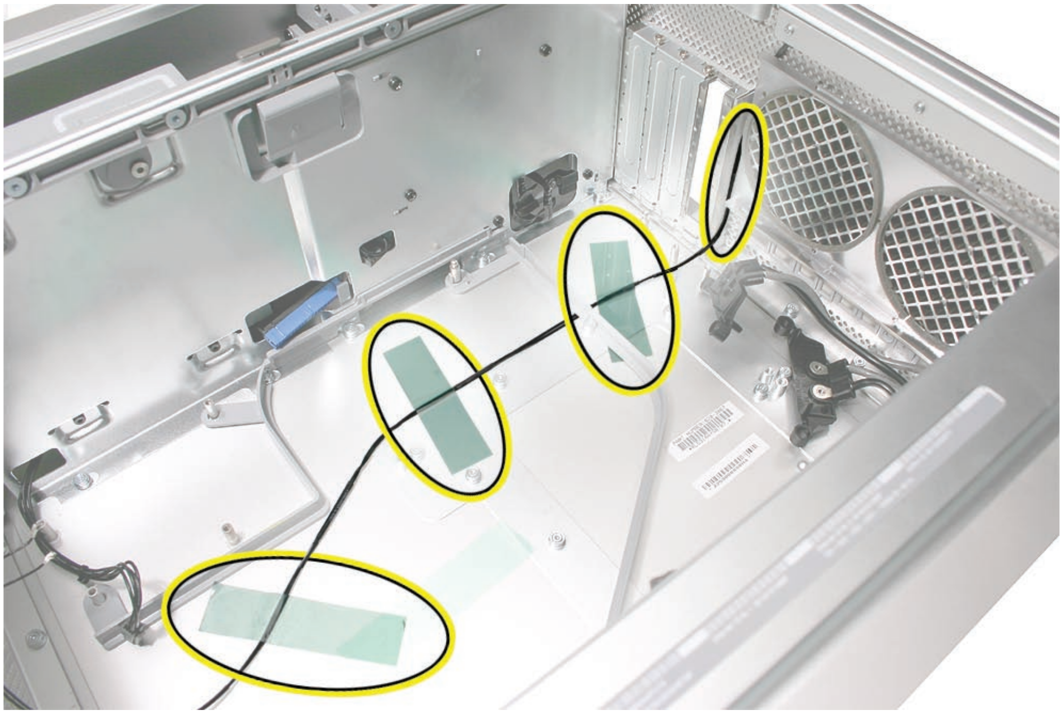
- Front inlet fan assembly
- Heatsink cover
- Processor inlet frame (Dual 2.0/2.3 GHz) or Processor inlet frame (Quad)
- Processor (Dual 2.0/2.3 GHz) or Processor (Quad)
- Processor support bar
- All graphics and PCI Express cards
- AirPort Express/Bluetooth combo card and runway card
- Rear exhaust fan assembly
- PCI card guide
- Speaker/fan assembly
- Front panel board
- PCI divider
- Logic board

Part Location

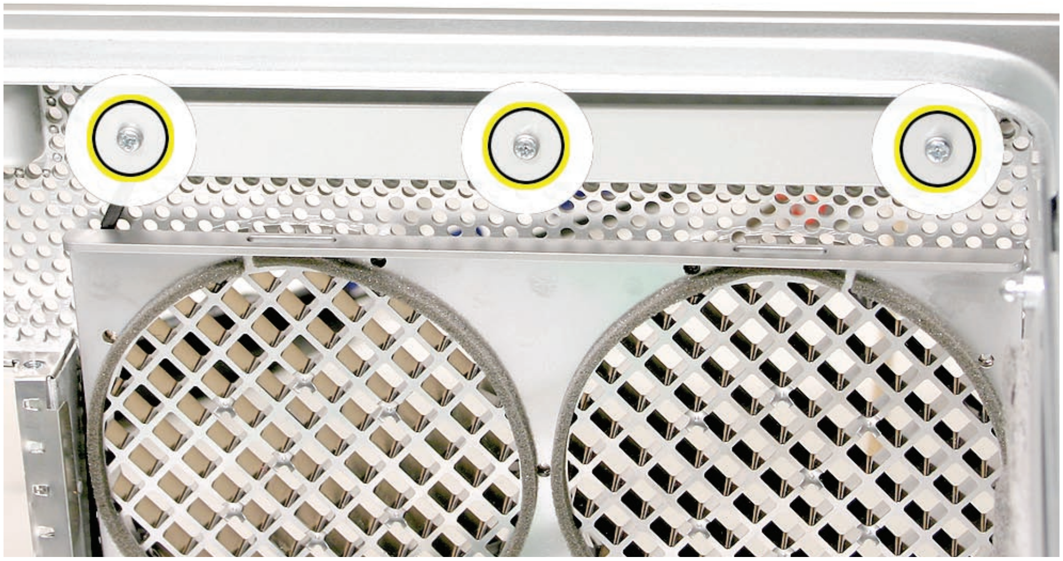


Procedure

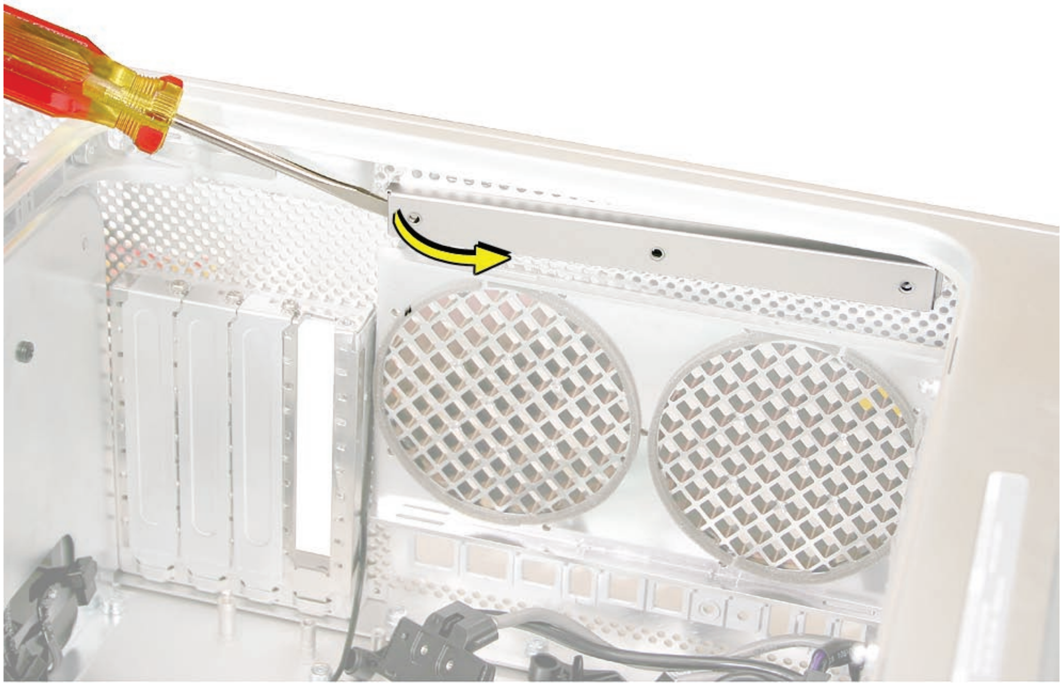
1. Remove the antenna cables from the tape on the inside of the enclosure's side panel and from the channel between the PCI cage and the rear exhaust openings on the inside of the enclosure's back panel.



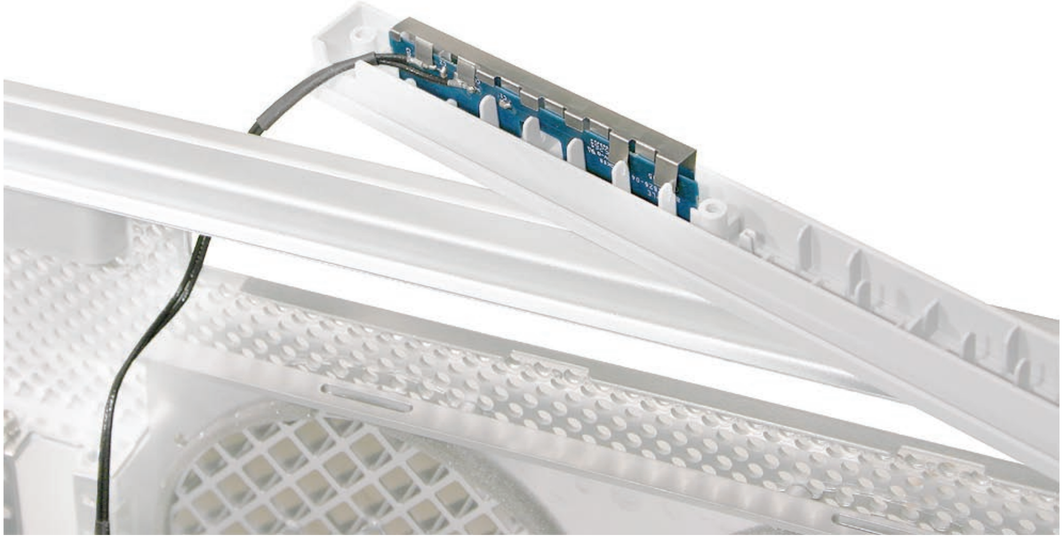
2. Remove the three screws on the interior antenna board cover.
   Note: This procedure will also release the exterior antenna board cover on the back panel.



3. Using a flatblade screwdriver, pry up the interior antenna board cover and remove the cover from the enclosure.

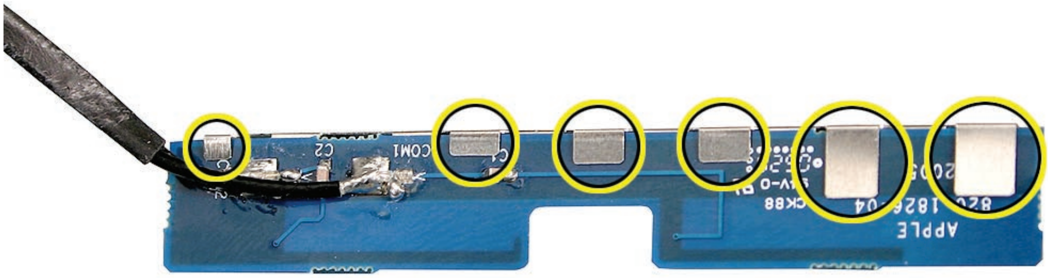


4. Remove the antenna board from the slot in the exterior antenna board cover.

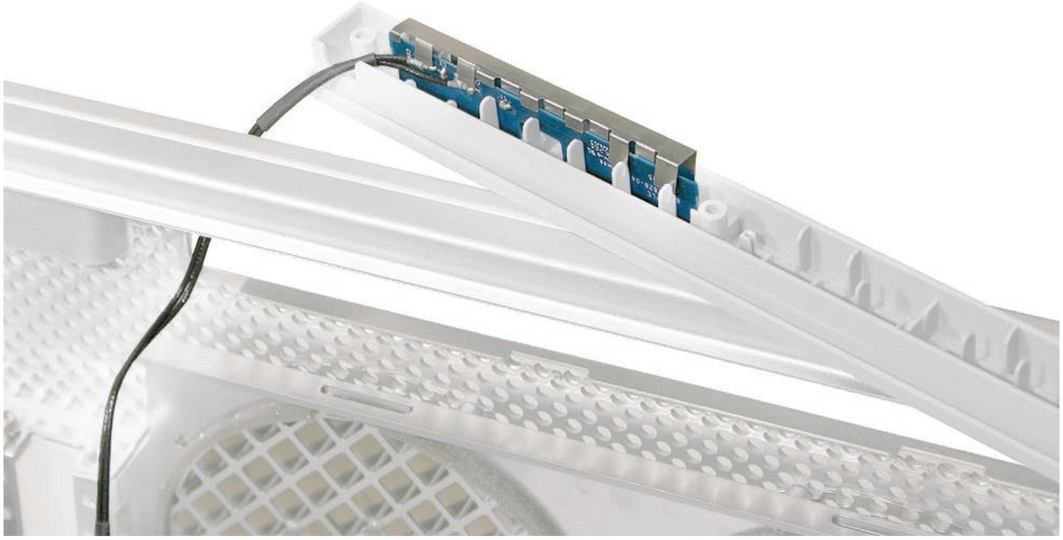


5. Remove the antenna board and cables from the enclosure.

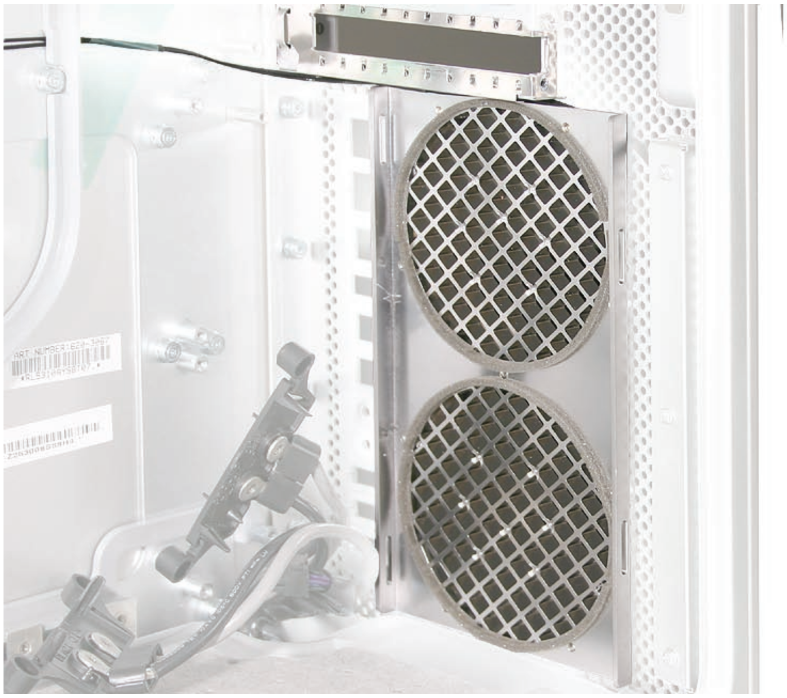
   Note: If you are replacing the antenna board/cables with a new board/cables, transfer the grounding clip from the original antenna board to the replacement board.



Replacement Note: Insert the antenna board into the slot in the exterior antenna board cover as illustrated.



Replacement Note: Be sure to reroute the antenna cables in the channel between the PCI cage and the rear exhaust openings on the inside of the enclosure's back panel.



Power Supply

Tools

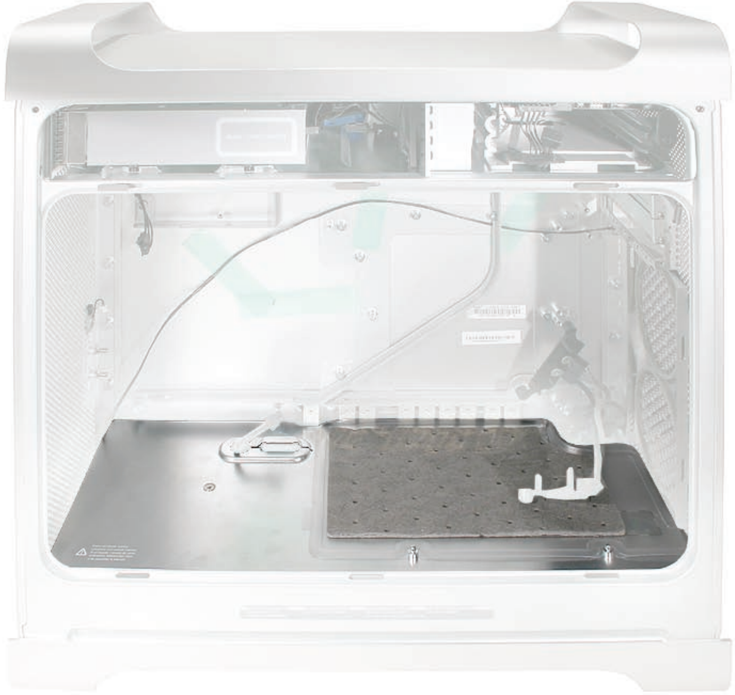
The only tools required for this procedure are a Phillips #1 screwdriver and 1/4-inch nut driver.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

- Front inlet fan assembly
- Heatsink cover
- Processor inlet frame (Dual 2.0/2.3 GHz) or Processor inlet frame (Quad)
- Processor (Dual 2.0/2.3 GHz) or Processor (Quad)
- Processor support bar
- All graphics and PCI Express cards
- AirPort Express/Bluetooth combo card and runway card
- Rear exhaust fan assembly
- PCI card guide
- Speaker/fan assembly
- Front panel board
- PCI divider
- Logic board

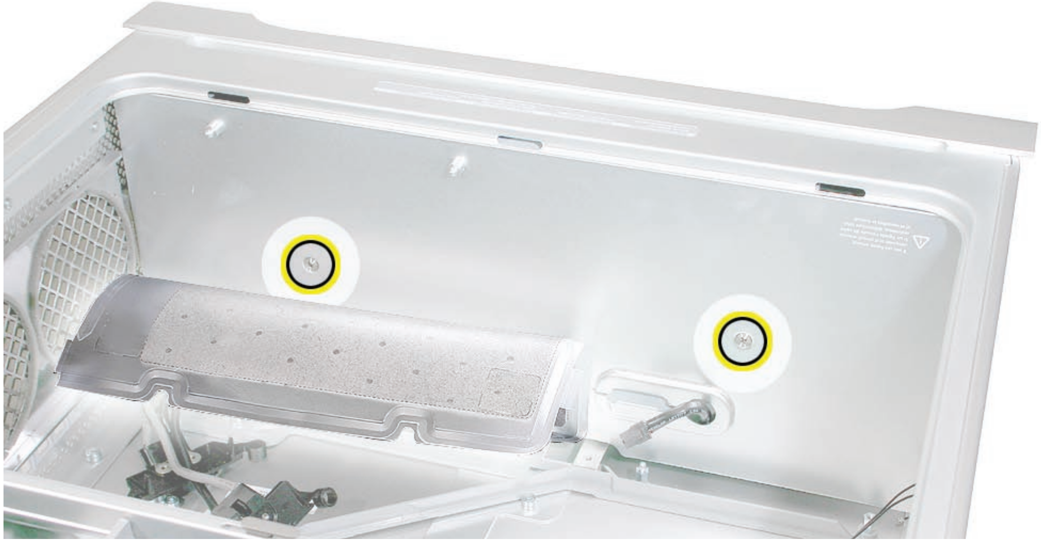
Part Location



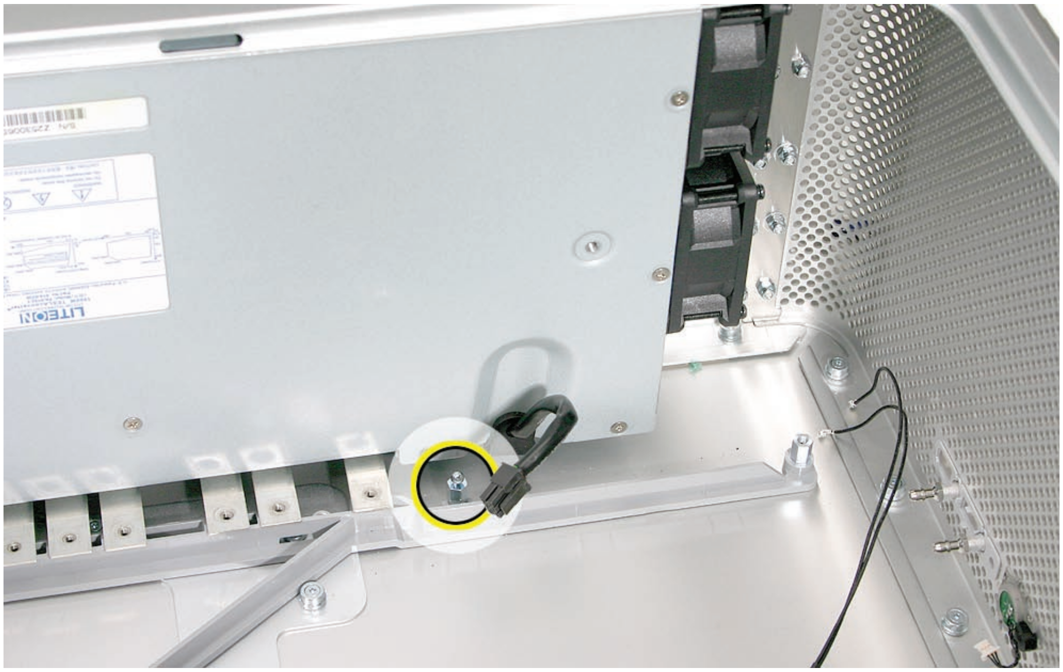
Procedure

1. Position the computer so the power supply is at the top.
2. Using a Phillips #1 screwdriver, remove the two screws that secure the power supply top cover, and remove the cover from the enclosure.

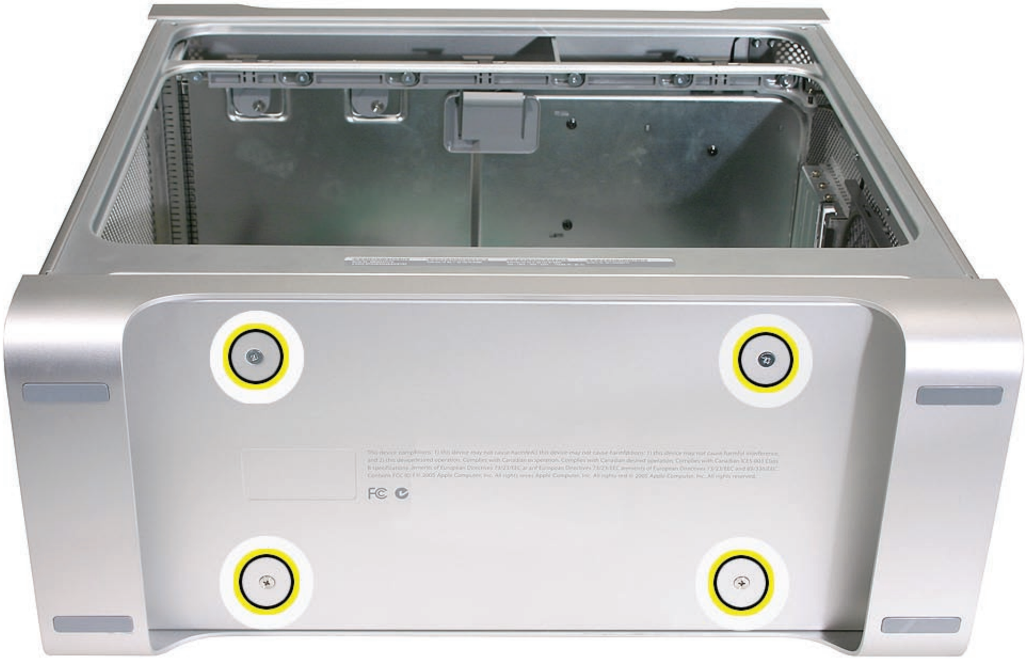
   Note: On some power supplies, a pad attached to the top of the power supply covers the left screw. To access this screw, gently peel back the pad as illustrated.



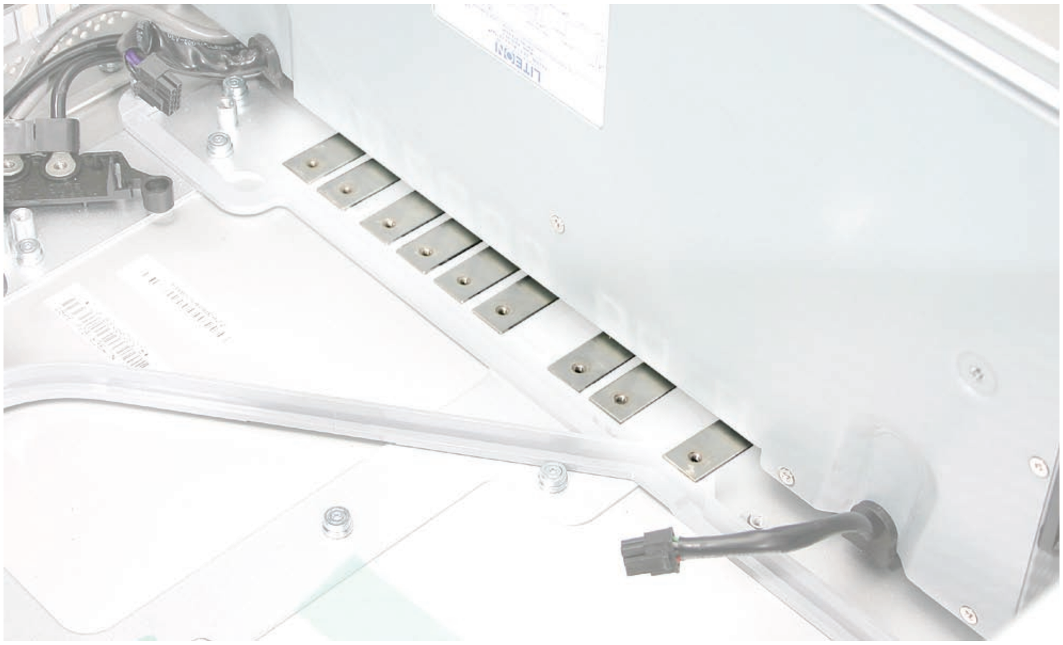
3. Using a 1/4 inch nut driver, remove the mushroom-head standoff closest to the power supply.



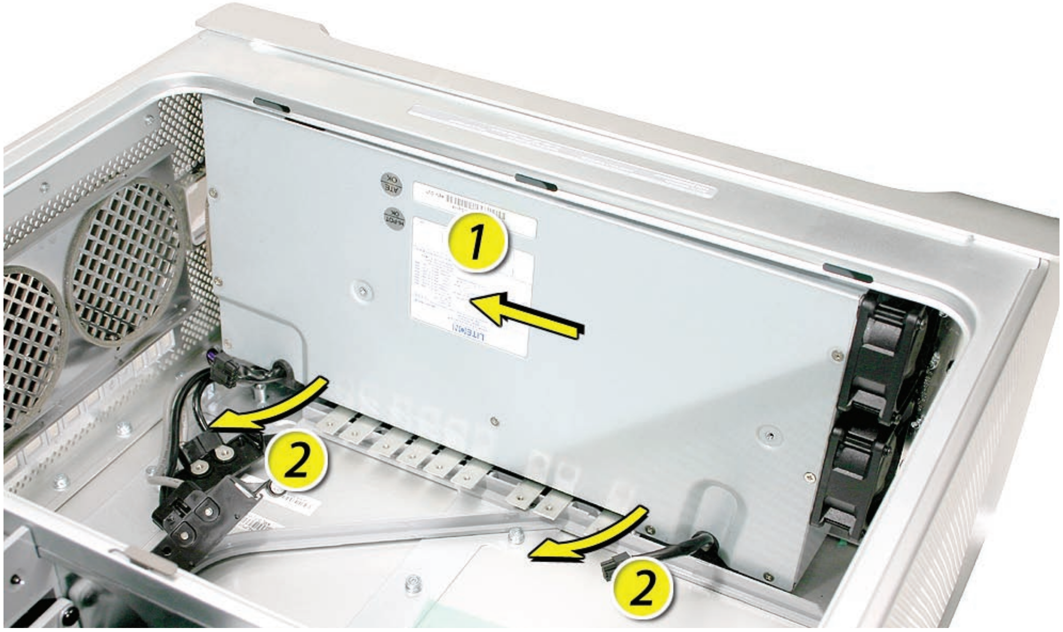
4. Using the Phillips screwdriver, remove the four power supply mounting screws on the bottom of the enclosure.



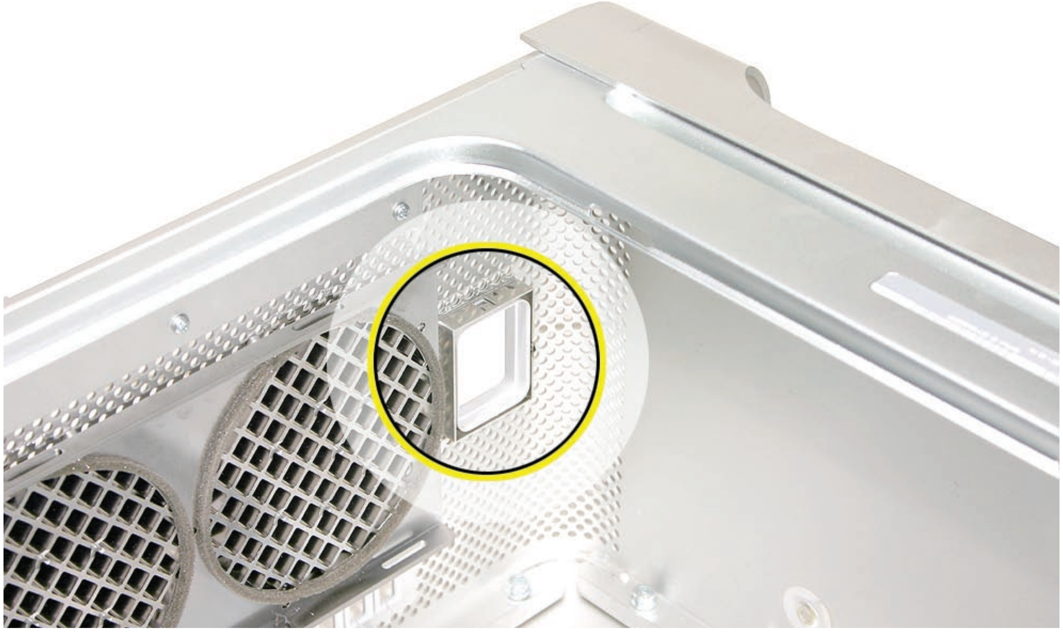
5. Lift up the bus bar tabs to release them from the enclosure.



6. Slide the power supply toward the front of the computer.
7. Tilt the bus bar tab edge of the power supply a short distance out of the bottom of the enclosure.
8. Rotate the power supply up and remove it from the enclosure.

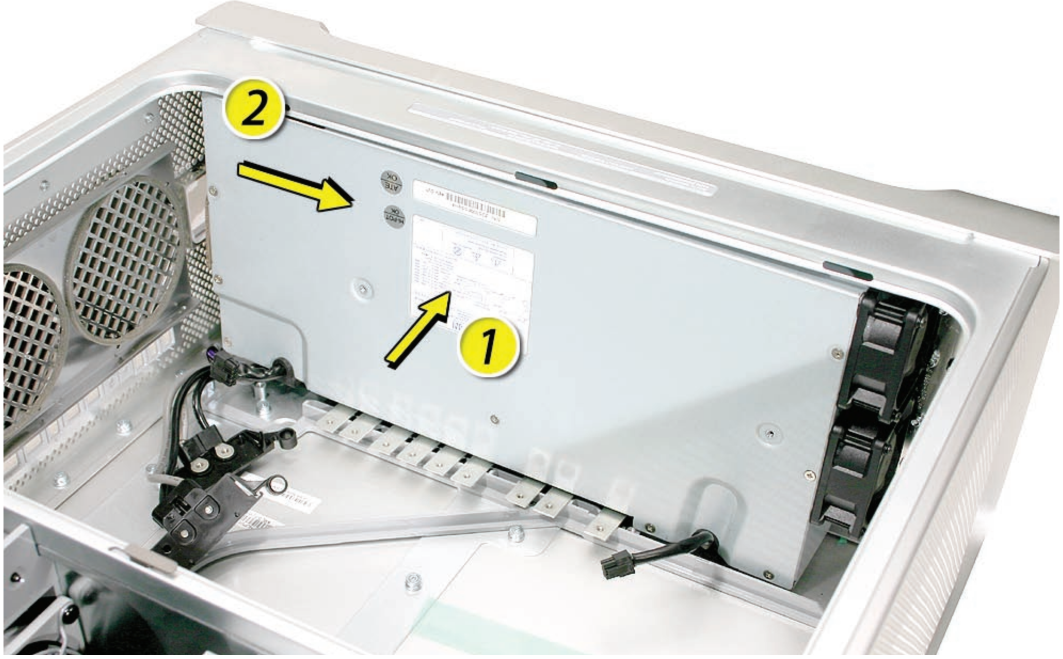


Replacement Note: Make sure the plastic trim ring is in place in the power receptacle before replacing the power supply in the enclosure.

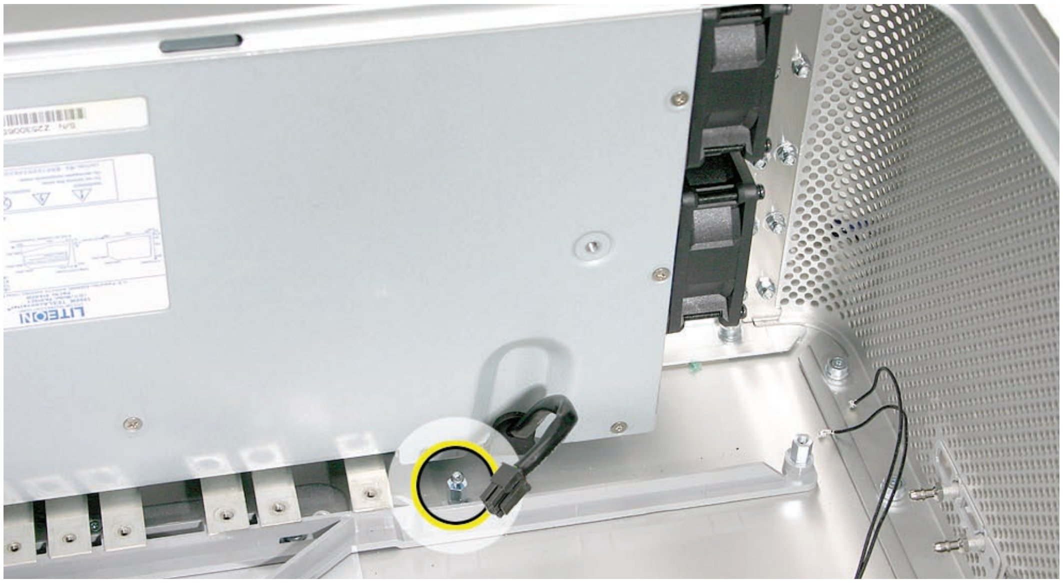


Replacement Note: To fit the power supply back into the enclosure, align the power supply so that it is parallel to the bottom panel and push the power supply straight back until the bus bar tabs snap into place. Then slide the power supply toward the back of the computer, making sure the power receptacle aligns with the opening in the back panel.

Note: Make sure the power supply cables do not catch on the enclosure or under the power supply.



Replacement Note: Be sure to replace the mushroom-head standoff after installing the power supply in the enclosure.



Air Deflector Sensor Board

Tools

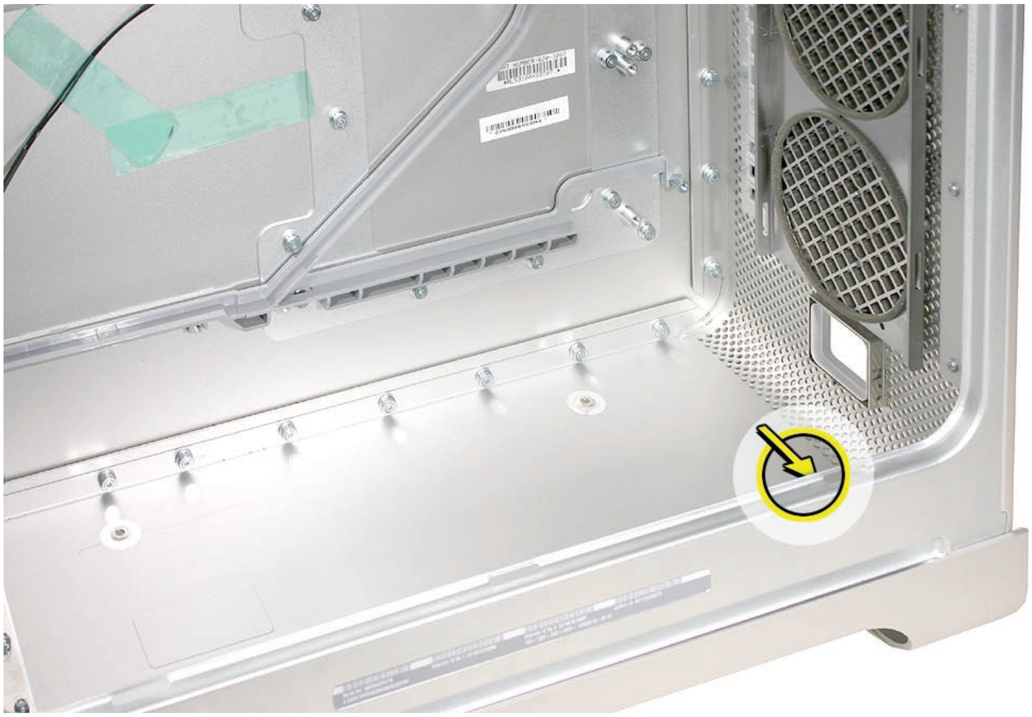
The only tool required for this procedure is a flatblade screwdriver. A small mirror to use in locating the board is optional.

Preliminary Steps

Before you begin, open the computer, lay it on its side with the access side facing up, and remove the following:

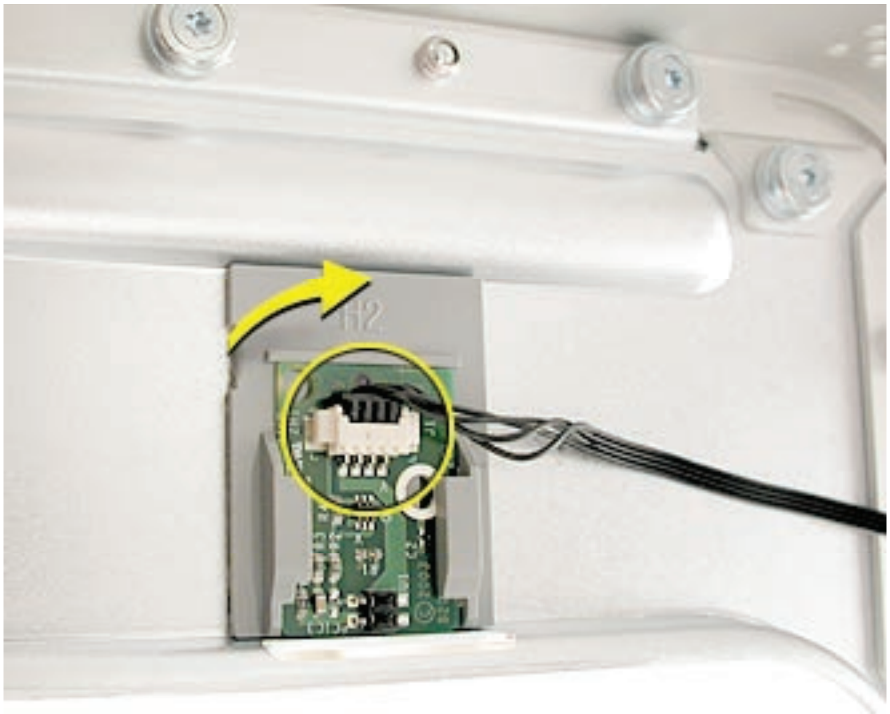
- Front inlet fan assembly
- Heatsink cover
- Processor inlet frame (Dual 2.0/2.3 GHz) or Processor inlet frame (Quad)
- Processor (Dual 2.0/2.3 GHz) or Processor (Quad)
- Processor support bar
- All graphics and PCI Express cards
- AirPort Express/Bluetooth combo card and runway card
- Rear exhaust fan assembly
- PCI card guide
- Speaker/fan assembly
- Front panel board
- PCI divider
- Logic board
- Power supply

Part Location



Procedure

1. Locate the air deflector sensor board inside the enclosure on the bottom right front corner of the frame. You may find a small mirror useful in seeing the board.
2. Disconnect the sensor cable from the air deflector sensor board.
3. Pry up the sensor board from the frame and remove the board from the enclosure.
   Note: Adhesive on the back of the board attaches the sensor board to the frame.



Service Source

Troubleshooting

Power Mac G5 (Late 2005)

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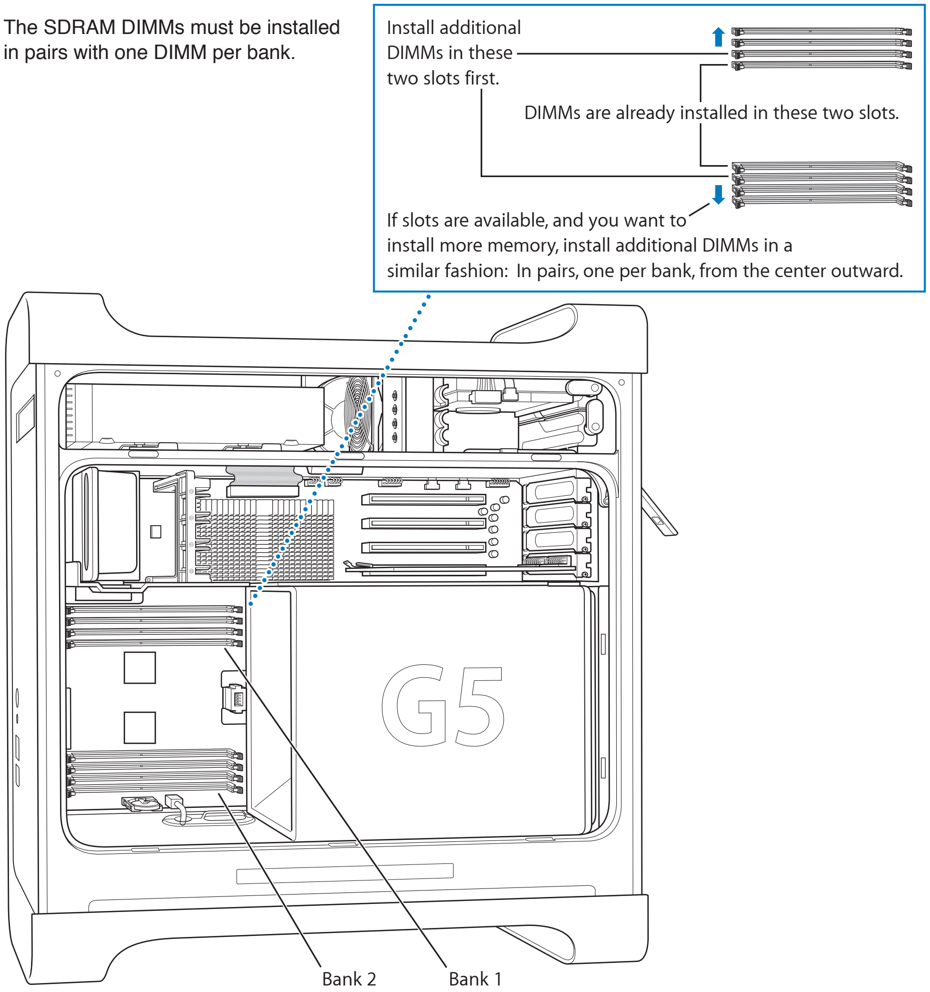
General Information

DDR Memory

The Power Mac G5 (Late 2005) has eight DIMM slots for PC2 4200, 533 MHz, Double-Data-Rate 2 (DDR2) SDRAM DIMMs. The slots are arranged in two banks of four slots each. Power Mac G5 (Late 2005) computers come with a minimum of 512 MB of RAM, installed as a pair of 256 MB DIMMs in the two center slots. Additional DIMMs can be installed in the open DIMM slots, as illustrated below.

Note: DIMMs must be installed in equal-sized pairs from the center outward.

The SDRAM DIMMs must be installed in pairs with one DIMM per bank.



Install additional DIMMs in these two slots first.

DIMMs are already installed in these two slots.

If slots are available, and you want to install more memory, install additional DIMMs in a similar fashion: In pairs, one per bank, from the center outward.

In the Power Mac G5 (Late 2005), DIMMs must fit these specifications:

- PC2 4200, 533 MHz, DDR2 DIMMs
- 240-pin module
- Maximum number of memory devices on DDR2 SDRAM: 16
- Nonparity
- No error-correcting codes (non-ECC) modules are preferred but you can also use ECC modules. However, do no mix ECC and non-ECC memory modules.
- Unbuffered (registered or buffered DDR2 SDRAM cannot be used)

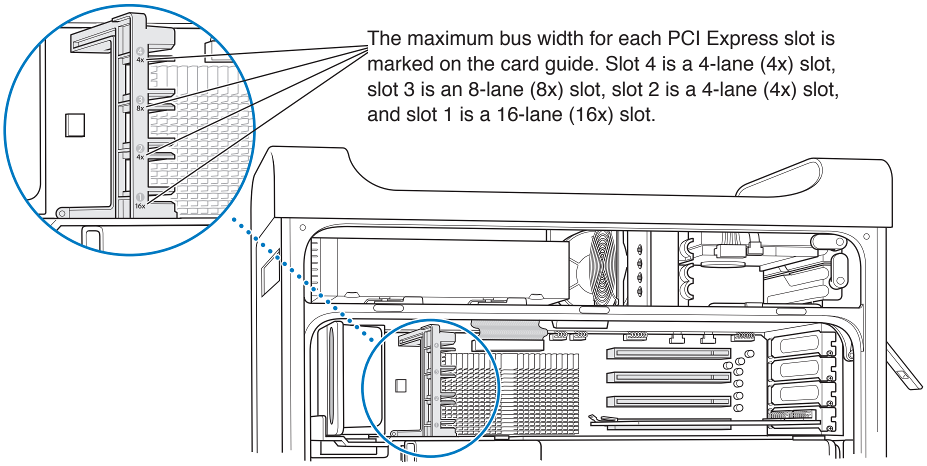
Important: Memory from older Macintosh computers is not compatible with the Power Mac G5 (Late 2005).

PCI Express Cards

Power Mac G5 (Late 2005) computers have four expansion card slots that accommodate PCI Express cards. The computers come with a high-performance 16-lane (16x) PCI Express graphics card installed in slot 1. The card contains the graphics processor unit (GPU) and provides the computers' display ports.

You can install additional PCI Express cards in slots 2–4. Install a second card in slot 3, a third in slot 4, and a fourth in slot 2 to take advantage of the bus bandwidth of each slot. Before installing a card, however, check the specifications to make sure it can operate correctly in the Power Mac G5 (Late 2005).

Note: When certain high-end video cards are installed in slot 1, they block the adjacent PCI Express slot (slot 2). As a result, you can install PCI Express cards in slots 3 and 4 but not in slot 2.



The maximum bus width for each PCI Express slot is marked on the card guide. Slot 4 is a 4-lane (4x) slot, slot 3 is an 8-lane (8x) slot, slot 2 is a 4-lane (4x) slot, and slot 1 is a 16-lane (16x) slot.

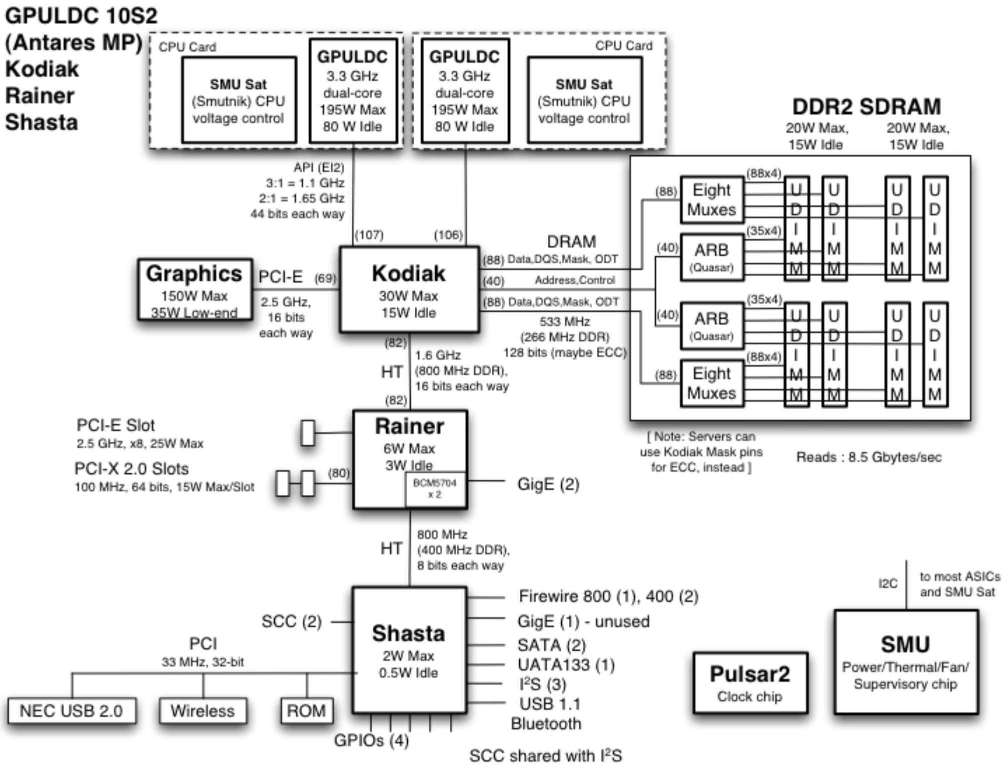
Important: Combined maximum power consumption for all four expansion slots should not exceed 200 W. Combined maximum video RAM for all graphics cards is 1 GB.

While all slots can accommodate PCI Express cards that have up to 16-lanes, if you install a card that requires a greater bandwidth than the slot provides, the card will operate at the bandwidth of the slot. For example, an 8x card installed in a 4x slot will operate as a 4x card. Refer to the following table for details.

PCI Express Slot	Bus Bandwith (x)	Connector (Lane)
4	4x	16 lane
3	8x	16 lane
2	4x	16 lane
1	16x	16 lane

Block Diagram

The architecture of the Power Mac G5 (Late 2005 Quad) computer is illustrated below.


GPULDC 10S2
(Antares MP)
Kodiak
Rainer
Shasta
CPU Card
SMU Sat
(Smutnik) CPU
voltage control
GPULDC
3.3 GHz
dual-core
195W Max
80 W Idle
GPULDC
3.3 GHz
dual-core
195W Max
80 W Idle
CPU Card
SMU Sat
(Smutnik) CPU
voltage control
DDR2 SDRAM
20W Max,
15W Idle
20W Max,
15W Idle
API (EI2)
3:1 = 1.1 GHz
2:1 = 1.65 GHz
44 bits each way
(107)
(106)
(88)
Eight
Muxes
(88x4)
(40)
ARB
(Quasar)
(35x4)
(40)
ARB
(Quasar)
(35x4)
(88)
Eight
Muxes
(88x4)
UDIMM
UDIMM
UDIMM
UDIMM
UDIMM
UDIMM
UDIMM
UDIMM
DRAM
(88) Data,DQS,Mask, ODT
(40) Address,Control
(88) Data,DQS,Mask, ODT
533 MHz
(266 MHz DDR)
128 bits (maybe ECC)
Graphics
150W Max
35W Low-end
PCI-E
(69)
2.5 GHz,
16 bits
each way
Kodiak
30W Max
15W Idle
(82)
HT
1.6 GHz
(800 MHz DDR),
16 bits each way
(82)
Rainer
6W Max
3W Idle
BCM5704
x 2
GigE (2)
PCI-E Slot
2.5 GHz, x8, 25W Max
PCI-X 2.0 Slots
100 MHz, 64 bits, 15W Max/Slot
(80)
[Note: Servers can
use Kodiak Mask pins
for ECC, instead]
Reads : 8.5 Gbytes/sec
HT
800 MHz
(400 MHz DDR),
8 bits each way
I2C
to most ASICs
and SMU Sat
Shasta
2W Max
0.5W Idle
SCC (2)
PCI
33 MHz, 32-bit
NEC USB 2.0
Wireless
ROM
GPIOs (4)
Firewire 800 (1), 400 (2)
GigE (1) - unused
SATA (2)
UATA133 (1)
I²S (3)
USB 1.1
Bluetooth
SCC shared with I²S
Pulsar2
Clock chip
SMU
Power/Thermal/Fan/
Supervisory chip

Thermal Calibration

To ensure proper fan and temperature control in the Power Mac G5 (Late 2005), you must run Apple Service Diagnostic whenever you replace a processor or logic board with a new processor or logic board. Apple Service Diagnostic for Power Mac G5 is available as a download from **http://www.info.apple.com/discimages/**.

Note: The calibration process of Apple Service Diagnostic requires a controlled environment to ensure accurate ambient temperature readings. Computers under test must have the transparent air deflector installed and the door sensor switch must be operable. Units under test should also be located away from heating and air conditioning systems and fan exhaust of other machines. Ambient temperature should not go above 77 degrees Fahrenheit or 25 degrees Centigrade.

Resetting the Logic Board

Many system problems can be resolved by resetting the logic board. Because the Power Mac G5 (Late 2005) uses a System Management Unit (SMU) controller chip rather than a Power Management Unit (PMU) controller chip, the logic board does not include a reset button. Instead, to reset the logic board, do the following:

1. Shut down the computer.
2. Unplug the computer from its power source.
3. Wait two minutes.
4. Plug the power cord back in, and turn the computer on. If the computer does not power on, there is something else wrong with it; refer to the "**Startup Failures**" section of "Symptom Charts" in this chapter.

Power-On Self Test: RAM and Processor Verification

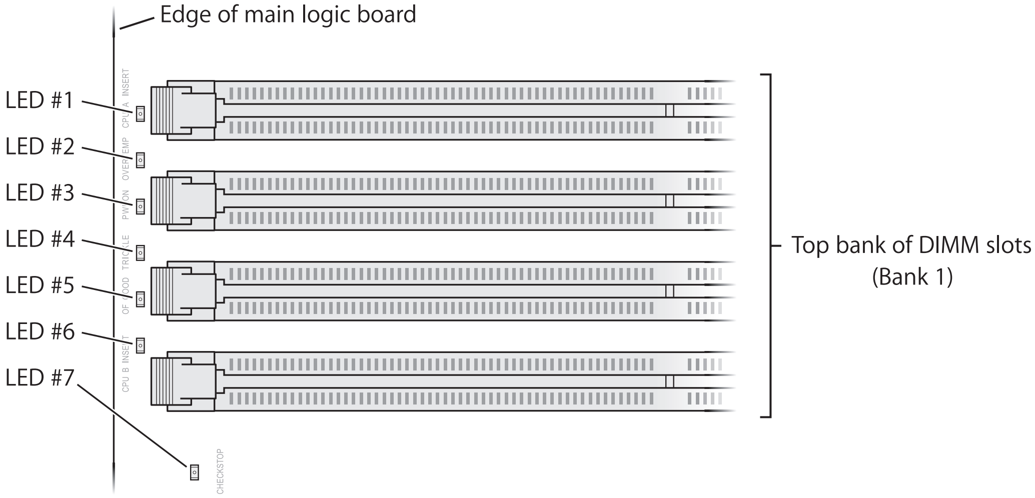
A power-on self test in the computer's ROM automatically runs whenever the computer is started up after being fully shut down (the test does not run if the computer is only restarted). If the test detects a problem, the status LED located above the power button on the front of the computer will flash in the following ways*:

- 1 Flash: No RAM is installed or detected.
- 2 Flashes: Incompatible RAM types are installed.
- 3 Flashes: No RAM banks passed memory testing.
- 4 Flashes: No good boot images are detected in the boot ROM (and/or there is a bad sys config block).
- 5 Flashes: The processor is not usable.

* **Note:** The status LED lights up when the power button is depressed at startup. Do not count this light as one of the diagnostic flashes.

Diagnostic LEDs

Power Mac G5 (Late 2005) logic boards include a set of LEDs to help service providers troubleshoot the computers. The LEDs are located to the left of the top bank of DIMM slots.


Edge of main logic board
LED #1
LED #2
LED #3
LED #4
LED #5
LED #6
LED #7
CPU A INSERT
OVERTEMP
PWR ON
TRICKLE
OF GOOD
CPU B INSERT
CHECKSTOP
Top bank of DIMM slots (Bank 1)

Use the table on the following page to interpret the LEDs.

Diagnostic LED Table

LED	Description	Indication	Color When On	Expected Condition	LED "On" Indicates	Things to Check	Next Steps
No 1	CPU A	CPU A Installation	Red	Off	CPU A Improperly Installed	Is CPU assembly seated properly? Check that mounting screws are properly tightened.	Verify CPU screws are tight. Remove the CPU assembly and check for damaged pins on connector. Replace CPU with damaged pins.
No 2	Overtemp LED	MPU Overtemp	Red	Off	CPU has gone Overtemp	Check that space is allowed for fans to ventilate. Verify fans and sensors are connected.	Reseat CPU Fan, Run Thermal Calibration in Apple Service Diagnostics. Replace CPU.
No 3	Power On	With Duct Door Open	Red	On (With Duct Door Open)	Main Power OK and within regulation	Connections to the power bus bar	Check operation of the air deflector sensor. Replace Power supply
No 4	Trickle Power	With Duct Door Open	Yellow	On - When unit plugged into AC power (With Duct Door Open)	AC Power OK	Check for AC power at the wall outlet; try another outlet	Check operation of the air deflector sensor. Replace power supply
No 5	Open Firmware Good	With Duct Door Open	Green	On (With Duct Door Open)	CPU arrived at Open Firmware (Main Logic Board is OK)	Reset SMU. Check for RAM errors.	Check operation of the air deflector sensor. Replace processor, or main logic board.
No 6	CPU B	CPU B Installation	Red	Off	CPU B Improperly Installed (LED only present on Quad)	Is CPU assembly seated properly? Check that mounting screws are properly tightened.	Remove the CPU assembly and check for damaged pins on connector. Reinsert the CPU module.
No 7	Checkstop	CPU Hang	Red	Off	Indicates CPU Hang When "On"	Check RAM	Verify CPU screws are tight. Check that CPU assembly is seated properly. Remove the CPU assembly and check for damaged pins on connector. Replace CPU. Replace logic board.

Notes for LED Table

- Power Mac G5 (Late 2005 Dual 2.0/2.3 GHz) logic boards include LEDs 1–5 and LED 7, but not LED 6. Power Mac G5 (Late 2005 Quad) logic boards include LEDs 1–7.
- CPU A is located closest to the PCI Express slots; CPU B is located below CPU A (closer to the power supply). Make sure CPU screws are tight.
- LEDs 3, 4, and 5 operate differently from the other LEDs. They remain off until you remove the air deflector (clear door inside the side access panel), at which point they should go on. If LED 3, 4, or 5 is on before you remove the air deflector, check the operation of the air deflector sensor. Note that the fans will run at high speed while the air deflector is removed.
- LED 5 verifies that Open Firmware has loaded. To allow time for it to load, be sure to wait at least one minute from first power up before you check this LED.

Power Supply Verification

To power on, the computer's logic board requires "trickle" power. If the system fails to power on, first reset the SMU (remove power cord for approximately two minutes). If the unit still doesn't power on, follow the procedure outlined below to determine whether the issue is related to the power supply.

Verify trickle power

Diagnostic LED 4 indicates the presence of trickle power required by the logic board to begin the startup process.
- Remove the clear plastic air deflector (fans will go to high while door is removed).
- LED 4 should be on and yellow, indicating that trickle voltage is present.

Verify Power Supply is providing power

Diagnostic LED 3 indicates that the main power is OK and within regulation.
- Plug in AC power cord, and press the power-on button on the front panel.
- Remove the clear plastic air deflector (fans will go to high while door is removed).
- LED 3 should be on and red, indicating that the main power is OK and within regulation.

Voltage Measurements

Note: Due to the size and location of the Power Mac G5 (Late 2005 Quad) processor module, it isn't possible to get access to the power bus bar screws to check the voltages. The following procedure can be used only for Power Mac G5 (Late 2005 Dual 2.0/2.3 GHz) computers.

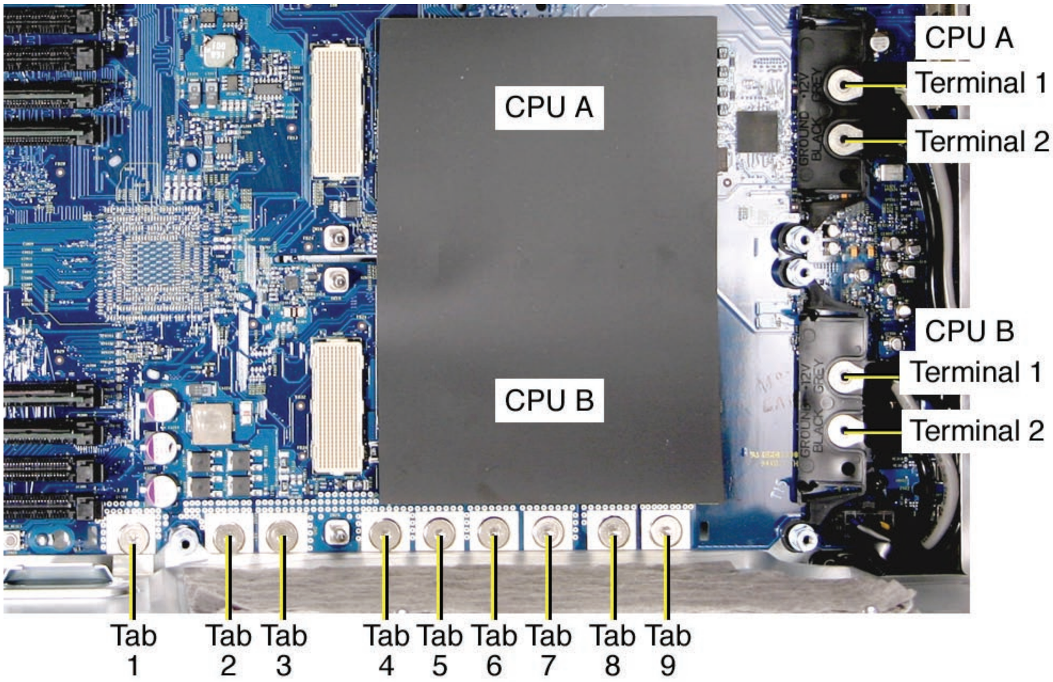
If the computer has trickle power and is capable of starting up, you may measure the voltages available from the power supply. Use a volt meter to take measurements at the screws that attach the power bus bar to the logic board, and at the terminal connections that provide power to the processor module.

Warning: During this procedure, do not let any fingers or the voltage probes come in contact with or get caught in the blades of the fans.

1. Remove the power cord from the computer.
2. Open the computer, and lay it on its side with the access side facing up.
3. Remove the metal G5 heatsink cover (let the unit cool before attempting measurements).
4. Plug a known good power cord into the computer and press the power button on the front of the unit.
5. Measure the voltages as indicated in the following tables.

Location of Bus Bar Tabs and Terminals

Note: This is a top view of the main logic board with the processor module removed. You must test the voltages with the processor module installed.


CPU A
Terminal 1
Terminal 2
CPU A
CPU B
CPU B
Terminal 1
Terminal 2
Tab 1
Tab 2
Tab 3
Tab 4
Tab 5
Tab 6
Tab 7
Tab 8
Tab 9

MLB Power Bus Bar

Voltage	Positive Lead	Ground Lead
3.3 V	Tab 1	Tab 4
5.1 V	Tab 2	Tab 4
0 V	Tab 3	Tab 4
0 V	Tab 4	Tab 5
0 V	Tab 5	Tab 4
0 V	Tab 6	Tab 4
0 V	Tab 7	Tab 4
12 VDC	Tab 8	Tab 4
12 VDC	Tab 9	Tab 4

Nominal	Min	Max
+3.3 VDC	3.14 VDC	3.48 VDC
+5.1 VDC	4.85 VDC	5.35 VDC
+12 VDC	11.4 VDC	12.60 VDC
+12 VDC	11.4 VDC	12.60 VDC

CPU Terminals CPU A

Voltage	Positive Lead	Ground Lead
12 V	Terminal 1	Terminal 2
0 V	Terminal 2	Tab 4

Nominal	Min	Max
+12 VDC	10.8 VDC	13.2 VDC

CPU Terminals CPU B

Voltage	Positive Lead	Ground Lead
12 V	Terminal 1	Terminal 2
0 V	Terminal 2	Tab 4

Nominal	Min	Max
+12 VDC	10.8 VDC	13.2 VDC

Symptom Charts

How to Use the Symptom Charts

The Symptom Charts included in this chapter will help you diagnose specific symptoms related to the product. Because cures are listed on the charts in the order of most likely solution, try the cures in the order presented. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next cure.

Note: If a cure instructs you to replace a module, reinstall the original module before you proceed to the next cure.

Important: The only way to shut off power completely to the computer and display is to disconnect their power plugs from the power source. Make sure the power cords to the computer and display are within easy reach.

Startup Failures

When testing a computer for the following symptoms, remove the side access panel so you can better observe or listen for fan movement.

Note: Be sure to check the "**DDR Memory**" and "**Power-On Self Test**" topics in the General Information section of this chapter. Incorrect installation of DIMMs or incompatible memory will not allow the system to start up correctly. For information on how to correctly install DIMMs, see the "**Memory (DIMMs)**" topic in the Take Apart chapter.

Power-on LED does not illuminate when power button is pressed, fans do not spin, and there is no boot tone or video

1. Verify power outlet is good.
2. Check that diagnostic LED 4 is on when the power cord is connected and the air deflector is removed.
3. Replace power cord.
4. Check that diagnostic LED 3 is on when the power cord is connected and the air deflector is removed.
5. Reset the logic board. Refer to "**Resetting the Logic Board**" in this chapter.
6. Verify power supply cables are fully connected and power bus bar screws are tightened.
7. Verify that processors are properly seated. Check diagnostic LED 1 and/or LED 6.

8. Verify that processors' mounting screws are properly tightened.
9. Reseat front panel board.
10. Test whether the front panel board or power button is at fault. Remove the installed front panel board and swap it for a known-good front panel board.
11. Replace front panel board.
12. Replace power button.
13. Replace logic board.
14. Replace power supply.

Power-on LED illuminates when pressed in, but goes out when button is released, fans spin, and there is no boot tone or video

1. Verify that the processor module is properly seated. Check diagnostic LED 1 and/or LED 6.
2. Verify that the processor mounting screws are properly tightened.
3. Check for trickle voltage from the power supply. Refer to "**Power Supply Verification**" in this chapter. If verification fails, replace power supply.
4. Replace logic board.

Power-on LED illuminates when power button is pressed but fans do not spin (or spin only momentarily) and there is no boot tone or video

1. Reseat video card. (Make sure video card is fully inserted in connector and end of card is secured by the connector latch.) For video cards that require power cables, check that they are connected.
2. Reset logic board. Refer to "**Resetting the Logic Board**" in this chapter.
3. Verify power supply cables are fully connected and power bus bar screws are tightened.
4. Check diagnostic LED 1 and LED 6 for processor connection.
5. Reseat processor and check for bent pins.
6. Check for trickle voltage from the power supply. Refer to "**Power Supply Verification**" in this chapter. If verification fails, replace power supply.
7. Replace logic board.
8. Replace processor.

Power-on LED illuminates when power button is pressed and fans spin continuously but there is no boot tone or video

1. Reseat video card. (Make sure video card is fully inserted in connector and end of card is secured by the connector latch.) For video cards that require power cables, check that they are connected.
2. Verify speaker cable is fully seated.

3. Reset logic board. Refer to "**Resetting the Logic Board**" in this chapter.
4. Check diagnostic LED 1 and LED 6 for processor connection
5. Replace processor
6. Replace logic board

Power-on LED illuminates when power button is pressed, fans spin, and boot tone chimes, but there is no video

1. Reseat video card. (Make sure video card is fully inserted in connector and end of card is secured by the connector latch.) For NVIDIA Quadro FX 4500 graphics card, check that power cord for card is connected.
2. Reset PRAM (restart computer while holding down Command-Option-P-R keys until second boot tone chimes)
3. Reset logic board. Refer to "**Resetting the Logic Board**" in this chapter.
4. Replace video card
5. Replace logic board

Power-on LED does not illuminate when power button is pressed, but fans spin, boot tone chimes, and there is video

1. Reseat front panel board
2. Replace front panel board
3. Replace logic board
4. Replace power supply

Power-on LED illuminates, fans spin up, no boot tone, and the system shuts down within a few minutes

1. Check diagnostic LED 1 and LED 6.
2. Reseat the processor and check for bent pins
3. Replace the processor
4. Replace the logic board
5. Replace the power supply

Power-on LED illuminates, fans and processor pump run harder, there is no boot and the system shuts down within a few minutes

1. Remove the processor and look for loss of fluid on the absorbent liner on top of the power supply. If you see drops of fluid, replace the processor, otherwise go on to the next step.
2. Reseat the processor.
3. Replace the processor
4. Replace the logic board
5. Replace the power supply

Fluid leak is suspected and the computer is plugged in

1. Unplug the computer
2. Put on rubber gloves if handling a liquid cooling module that is leaking or suspected to be leaking
3. Remove the processor
4. Wipe the spill using rags, paper towels, or other suitable material. Contain and dispose of the cleaning materials according to locals laws and regulations.
5. Wash the skin with running water
6. Replace the processor
7. Replace modules that show corrosion to the traces or solder joints.

Fans

Individual fan failure

1. Replace fan
   Exception: The media blower located between the optical and hard drives cannot be replaced. You must replace the enclosure for this part.
2. Replace logic board

All fans run at high speed

1. Check for proper ventilation around the exterior of the computer.
2. Check that the clear plastic air deflector is in place.
3. Run Apple Service Diagnostic (refer to "**Thermal Calibration**" earlier in this chapter).

Processor fans run at high speed

1. Verify that the clear plastic air deflector door is in place.
2. Verify that the white sensor label is not damaged and is in place on the lower right tab of the air deflector door. If necessary, replace the air deflector.
3. Verify that the air deflector sensor board is operating properly.
   Note: You can differentiate a bad sensor label from a bad sensor board by the following: Remove the air deflector door. Slide a folded piece of paper through the slot in the enclosure where the right tab of the air deflector would normally be inserted. If the red LED goes out (but stays on with the door in place), the sensor label on the door is missing or damaged.
4. Check the sensor cable connection on the logic board (second from right connector located directly below the hard drives).
5. Replace the logic board.
6. Replace the air deflector sensor board.

Computer goes to sleep for no apparent reason

Two additional symptoms: The system log typically includes a message similar to: "PowerMac7,3 Thermal Manager: Thermal Runaway Detected: System Will Sleep." The customer may also note that the fans ramp up to a higher speed shortly before the computer sleeps.

1. Check that the fans are operating.
2. If the system log still reports Thermal Runaway, run Apple Service Diagnostic (refer to "**Thermal Calibration**" earlier in this chapter).
3. Replace the processor module.

Other Failures

Air deflector sensor

1. Reseat air deflector sensor board cable
2. Replace air deflector sensor board
3. Replace logic board

Optical drive

1. Replace optical drive cable
2. Replace optical drive
3. Replace logic board

FireWire port (front panel A)

1. Reseat front panel board
2. Replace front panel board
3. Replace logic board

Firewire port (rear A<->B)

Replace logic board

Firewire port (rear B<->B)

Replace logic board

Internal speaker

1. Check speaker cable connection
2. Replace speaker/fan assembly
3. Replace logic board

USB 2.0 (front port)

1. Reseat front panel board
2. Replace front panel board
3. Replace logic board

USB 2.0 (rear ports)

Replace logic board

Combo Card

1. Reseat antenna cables connected to Combo card
2. Replace Combo card
3. Replace antenna card
4. Replace logic board

Audio IO (front headphones)

1. Reseat front panel board
2. Replace front panel board
3. Replace logic board

Audio IO (rear audio line in; rear audio line out)

1. Check Sound settings in System Preferences
2. Replace logic board

Service Source

Views

Power Mac G5 (Late 2005)

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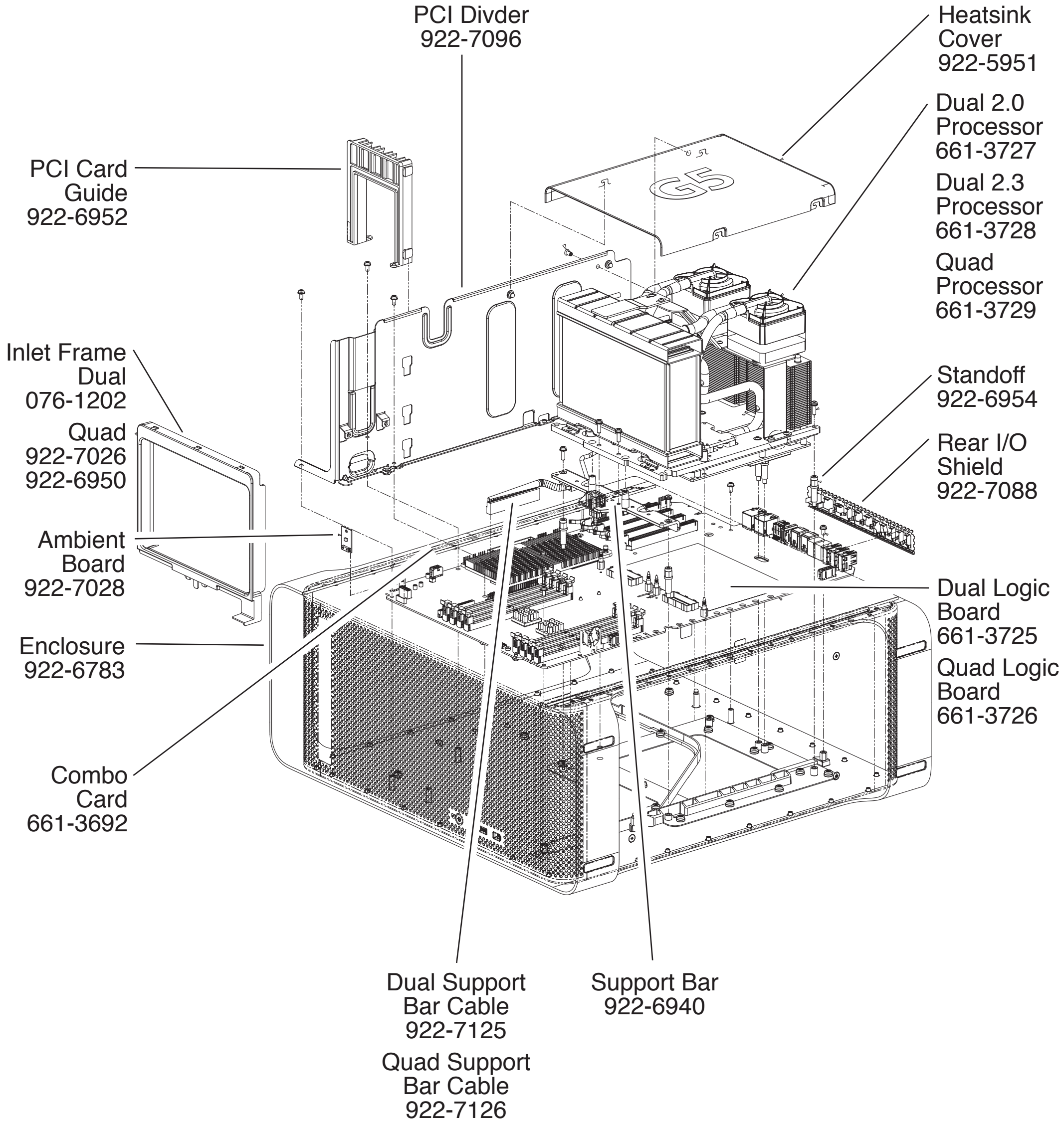
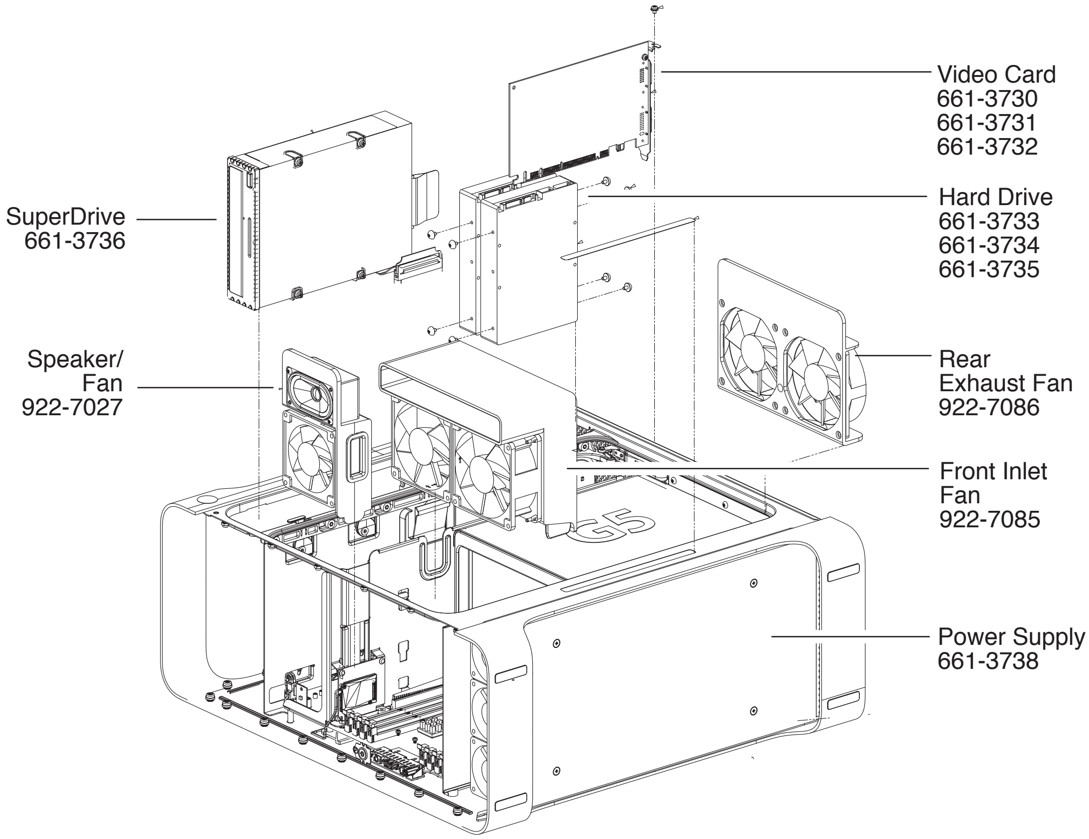
Exploded Views

Exploded View 1

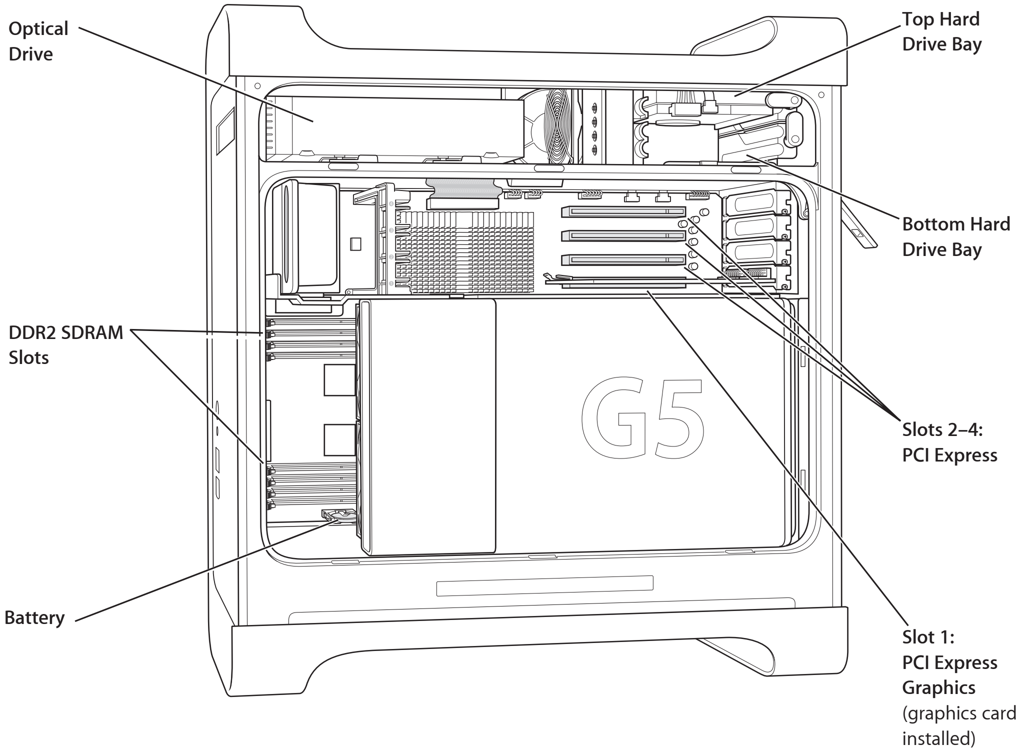

PCI Divder
922-7096
Heatsink
Cover
922-5951
Dual 2.0
Processor
661-3727
Dual 2.3
Processor
661-3728
Quad
Processor
661-3729
PCI Card
Guide
922-6952
Inlet Frame
Dual
076-1202
Quad
922-7026
922-6950
Standoff
922-6954
Rear I/O
Shield
922-7088
Ambient
Board
922-7028
Dual Logic
Board
661-3725
Quad Logic
Board
661-3726
Enclosure
922-6783
Combo
Card
661-3692
Dual Support
Bar Cable
922-7125
Quad Support
Bar Cable
922-7126
Support Bar
922-6940
G5

Exploded View 2

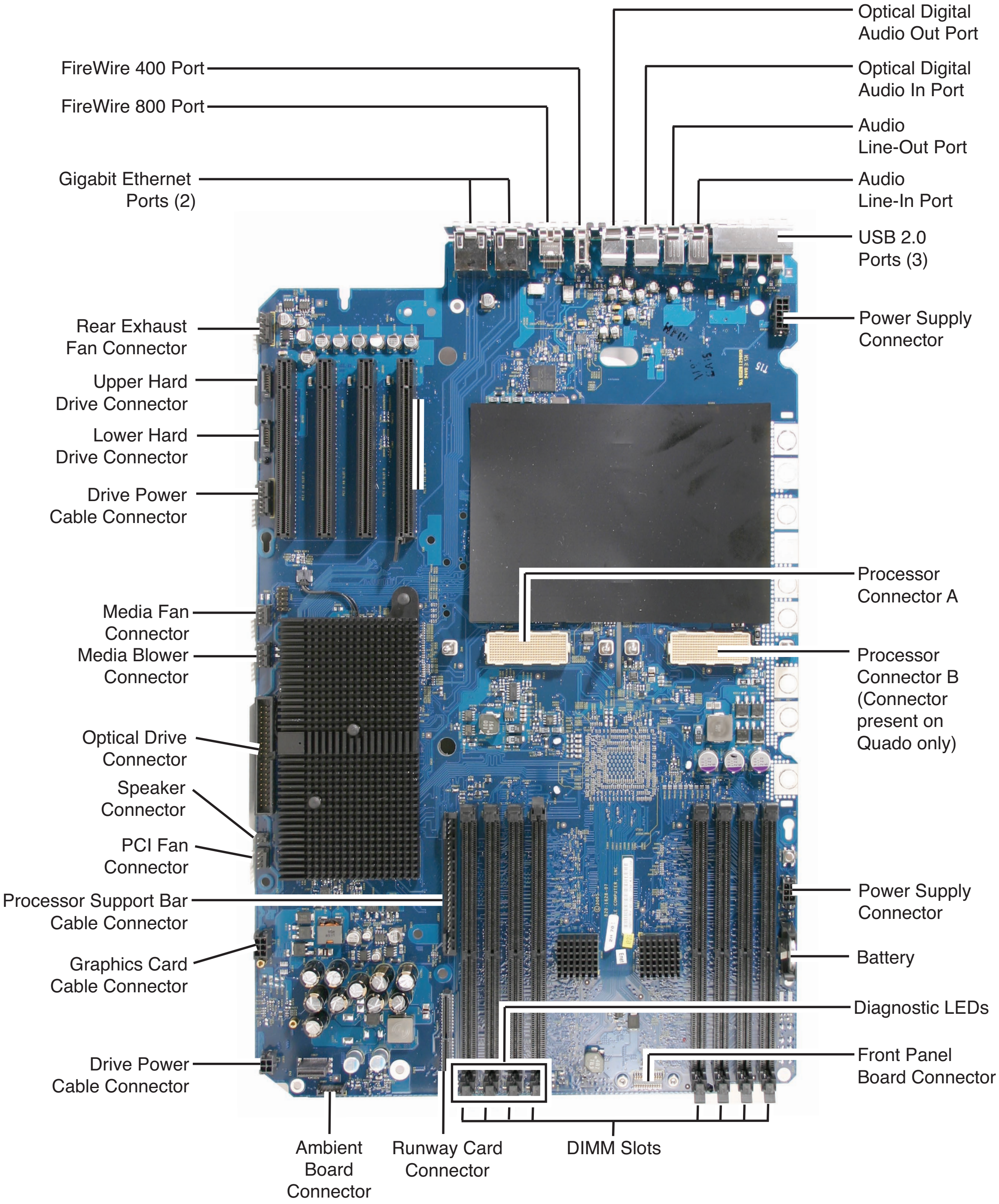

Video Card
661-3730
661-3731
661-3732
Hard Drive
661-3733
661-3734
661-3735
SuperDrive
661-3736
Speaker/
Fan
922-7027
Rear
Exhaust Fan
922-7086
Front Inlet
Fan
922-7085
Power Supply
661-3738

Internal Views

Overview

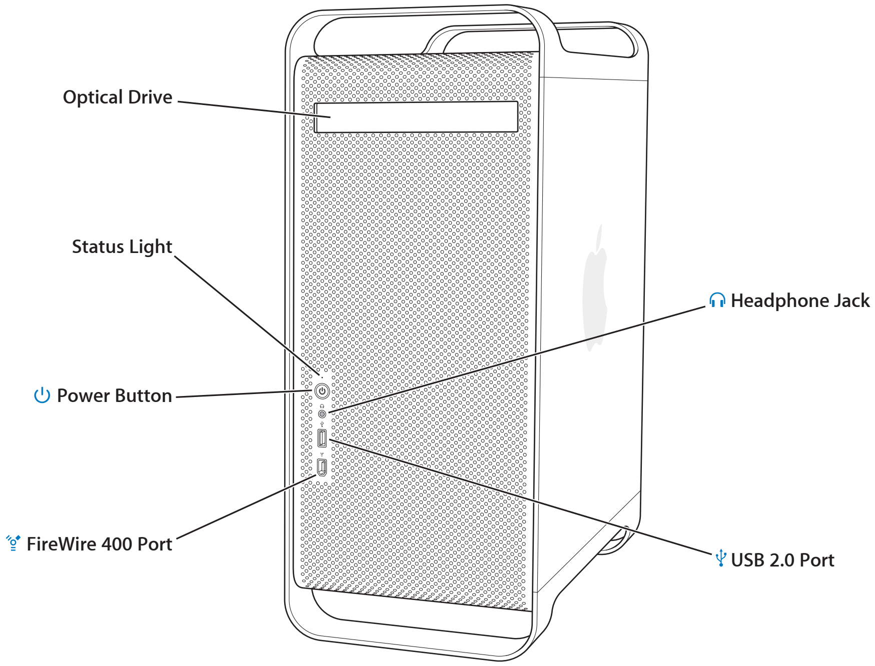

Optical Drive
Top Hard Drive Bay
Bottom Hard Drive Bay
DDR2 SDRAM Slots
G5
Slots 2–4: PCI Express
Battery
Slot 1: PCI Express Graphics (graphics card installed)

Logic Board

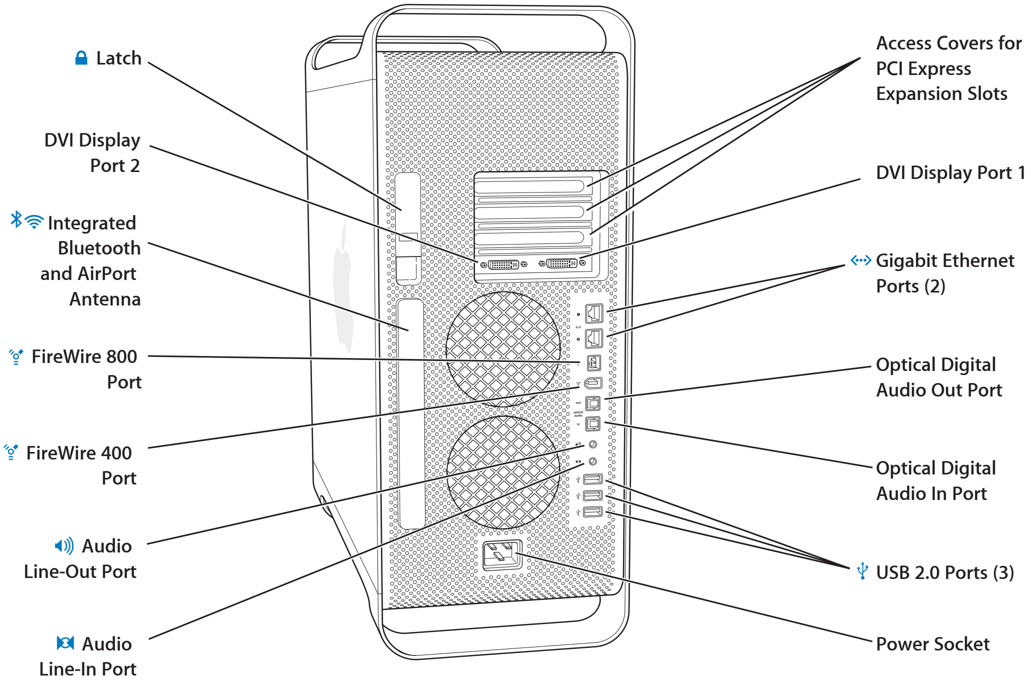

Optical Digital Audio Out Port
FireWire 400 Port
Optical Digital Audio In Port
FireWire 800 Port
Audio Line-Out Port
Gigabit Ethernet Ports (2)
Audio Line-In Port
USB 2.0 Ports (3)
Rear Exhaust Fan Connector
Power Supply Connector
Upper Hard Drive Connector
Lower Hard Drive Connector
Drive Power Cable Connector
Processor Connector A
Media Fan Connector
Media Blower Connector
Processor Connector B (Connector present on Quado only)
Optical Drive Connector
Speaker Connector
PCI Fan Connector
Processor Support Bar Cable Connector
Power Supply Connector
Graphics Card Cable Connector
Battery
Diagnostic LEDs
Drive Power Cable Connector
Front Panel Board Connector
Ambient Board Connector
Runway Card Connector
DIMM Slots

External Views

Front View


Optical Drive
Status Light
Headphone Jack
Power Button
FireWire 400 Port
USB 2.0 Port

Rear View


Latch
DVI Display Port 2
Integrated Bluetooth and AirPort Antenna
FireWire 800 Port
FireWire 400 Port
Audio Line-Out Port
Audio Line-In Port
Access Covers for PCI Express Expansion Slots
DVI Display Port 1
Gigabit Ethernet Ports (2)
Optical Digital Audio Out Port
Optical Digital Audio In Port
USB 2.0 Ports (3)
Power Socket